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The Farmer's Digest

Volume 14 May, 1950 Number 1

They're Building New Sheep

Condensed from The Farmer

William H. Kircher

GIVE us reasonable specifications of the kind of steer you want, and we can produce him in 15 years. Or if it's a new and superior hog you need, and you can define exactly what it is you want, we can produce it in 7 years. A new breed of sheep is yours in 11 years."

Dr. Lawrence M. Winters, University of Minnesota animal geneticist makes these forthright statements with the confidence that can be born only of proof.

And what is the proof? You may have seen some Minnesota No. 1 hogs. They came off the Winter's production line in seven years. The job might have been done in six, but Dr. Winters is a painstaking scientist. He wanted to be sure he had what he set out to get.

And now come sheep. One newly made breed is being tried on a few Minnesota farms. Others are in the making. On their backs is more and better wool than on most of the old breeds. These new sheep have the built-in ability to produce more pounds of fast, cheap gaining lamb than the breeds from which they came. They are hardy, thrifty, the kind of sheep that in a few years will be putting dollars in the pockets of all the Upper Midwest farmers who are interested in improving their flocks.

Dr. Winters started this work in 1941. Co-operating with him was Dow Daley, superintendent of the Grand Rapids Experiment Station. Later, Dr. Cummings joined the staff. What these men have been striving for (and it appears now they have it) is not so much a breed to be raised only in purebred flocks, but, instead, a breed which when mated to Hampshires, Shropshires or some other breed a farmer may have in his flock will produce more and better lambs than either side of the parentage. Such improvement comes of what practically every

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St. Paul, Minnesota, March 4, 1950

corn grower has learned is hybrid vigor.

But in the production of sheep, unlike corn, the producer can't get along with weak, puny, low producing inbreds. He must have lines which are themselves good producers. To get such lines the best characteristics of the breeds with which the geneticist is working must be concentrated in one.

When the work was started Dr. Winters specified for himself exactly what he wanted. This new breed of sheep was to be open-faced with heavy, fine fleece, an easy lamber, excellent mother, capable of producing more lambs per ewe than its parents, and, very important, a kind of lamb that would finish into a high quality carcass when its live weight had reached anywhere between 75 and 100 pounds.

After only nine years of work, there appear to be in the new Minnesota 100 sheep exactly the characteristics sought. To produce this breed the first matings were Cheviot rams to Rambouillet ewes, and Leicester rams to Rambouillet ewes. In these crossings there was sought the hardiness and fine wool of the Rambouillet, the growth and size of the Leicester, and the motherly characteristics, and the growth and size of the Cheviot. With the first generation of these matings as seed stock the line was closed to any outside mating and inbreeding was begun. Year by year the breeders have selected offsprings, observing conformation, carcass and fleece quality and quantity, productivity in terms of numbers of lambs, and all the other qualities that go to make a superior sheep.

There are now about 75 Minnesota No. 100 ewes and rams at the experiment station near Grand Rapids, under the practiced eye of the station animal husbandman, Kenneth Miller. Several rams have been introduced into Northern Minnesota farm grade flocks. A marked characteristic of these sheep as one watches them in the pasture or lot is their alertness. They aren't nervous—don't let themselves get sidetracked too often from their main business which is eating, but they are alert. Proof that this is a characteristic worth building into a sheep was brought out when bears attacked a mixed flock of Shropshires and Minnesota 100's at the Grand Rapids Station. Six ewes were killed, all of them Shropshires. Commenting on the importance of open faces, Dr. Cummings observed: "Watch open and closed faced sheep grazing together. The open faced sheep graze contentedly, certain always that neither man nor animal can sneak up and surprise them. Sheep half blinded by wool are nervous as they graze, always uncertain about what is around them."

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As for the purely economic characteristics of the 100's, fleece quality and weight and body weight at 20 weeks are revealing. Some lambs have weighed 90 pounds at 20 weeks, and every pound of it gained on grass and the milk from the ewes. The average weight will run between 75 and 80 pounds, and at those weights the lambs have the finish that pleases the buyer. Checks on farm flocks show weights averaging about 10 pounds less. Fleece weights are in the 9 to 10 and 11-pound range of exceptionally clean, low shrinking wool.

Another line of sheep, Minnesota 101 was started at the Crookston Experiment Station in 1942. These were started by breeding Oxford rams to Shropshire ewes, and later there was a small infusion of Hampshire. The line was then closed and inbreeding to fix the desirable characteristics was begun. There are now 60 of the 101 ewes at the Rosemount station. Their faces are not as open as the 100's but they have heavy, good quality fleeces, finish into desirable market lambs at early ages, and it appears that they will develop into a desirable breed for Middlewest farm flocks. In discussing these as in discussing the 100's, Dr. Cummings repeated again the aim of all this breeding which is the quality of lamb produced when 101 rams are mated to farm flock ewes. The 100's are proving this ability. The 101's have yet to prove it.

In addition to the 100's and 101's the inbreeding effort to produce superior sheep is being carried on with Shropshires and some very open faced Hampshires. The Hampshires are at the Rosemount Experiment Station. The Shropshires are divided between the Waseca and Crookston stations.

Another, and older line of inbred sheep than any developed at the experiment station is the North Star line which was started 60 years ago by the late W. W. Bell of near Beaver Creek, Minn. Mr. Bell was the kind of farmer who was always willing to try his hand at improving a breed of animal or a variety of crop that had shortcomings. From the day he started farming he had a band of ewes on his place, but neither those he owned nor those he bought had the quality and quantity of fleece that would satisfy him. To get it, he followed much the same procedure Dr. Winters and Dr. Cummings now follow. He crossbred for the characteristics he wanted, and then for decades inbred the line thus developed. The first cross was Oxford rams to Lincoln ewes, and later some Rambouillet was introduced. That done, the line was closed.

At wool shows, fleece from the Bell North Star sheep nearly al-

ways won blue ribbons. Lambs were of good quality too, finishing out satisfactorily at early ages. The sheep are of medium size, smooth bodied, fine boned and have open faces.

A few years ago, having heard much about the North Star sheep, Dr. Winters saw them and considered them important enough as a breed to buy several ewes and rams for the University. Some of these and their offspring are now at the Rosemount Experiment Station near the Twin Cities. They, like the 100's, 101's, and the inbred Shropshires and Hampshires, may someday be seen in many farm flocks.

What Sweet Clover Will Do

Condensed from Successful Farming

C. J. Willard
Ohio State University

IN NORTHERN Ohio a certain field has been farmed as one unit practically every year for 25 years. A few years ago, the field was split for a year, with half in wheat, half in corn. As soon as the wheat was off, that half was limed. The other side never was covered. The field went back together, and the whole thing was put in wheat, with a sweet clover seeding. The clover caught on the limed side, didn't on the other. Last spring, a year after it was seeded, the sweet clover was plowed down ahead of the corn crop.

And that one crop of plowed-down sweet clover made all the difference. Fertilizer, planting everything else was the same! We figured out a yield of 119.2 bushels to the acre where the sweet clover had been plowed under. On the other side, the sandy, corned-to-death soil gave only 32 bushels!

That's a tremendous difference, and you couldn't duplicate it every time. But still, sweet clover is the best legume catch crop that can be grown in the Cornbelt for soil improvement. Its greatest advantage is in a two-year grain-farming rotation of corn and small grain, with sweet clover sown in the small grain one year and plowed under a year later for corn.

This rotation is a wonderfully successful one clear across the Cornbelt. On soil types in all parts

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Des Moines, Iowa, March 1950

of Ohio, sweet clover between oats and corn has added 15 to 25 bushels per acre to the corn crop. Corn receiving 500 pounds per acre of sulfate of ammonia, without sweet clover, produced no more corn than plots with good sweet clover plowed under. In Iowa, Illinois, Indiana, and other Cornbelt states, sweet clover in this grain-farming rotation is fully equal to a liberal application of farm manure, in maintaining soil productivity.

Pasture is next in importance to soil improvement as a good use for sweet clover. Sweet clover has an enormous carrying capacity in May and June of the second year. But it dies by August 1, usually, and at least by September 1, so it provides comparatively little pasture during the short pasture period.

To get the most out of sweet clover pasture, it should be stocked heavily, early, so it does not grow more than about knee-high. Sweet clover is not as palatable as many other forages, and stock will usually eat everything else in the pasture first. This results in less bloat hazard from sweet clover than from alfalfa or Ladino. But the hazard is there, and you should take precautions. Turn animals in full, not hungry, then keep them on the pasture, and have some coarse, dry hay or straw in the pasture.

Sweet clover makes good hay late in the year it is sown, if you can afford the reduction in soil improvement caused by taking it off. First-year sweet clover is fine-stemmed and cures easily to a leafy, high-quality hay.

Second-year sweet clover should be used for hay only in emergencies. It is almost never desirable to plan to use it regularly, either alone or in mixture. Second-year sweet clover is coarse, sappy, hard to cure, and gets woody quickly. It should be cut before bloom to get good-quality hay, and high (8 to 20 inches) if it is not to be killed.

A big drawback to sweet clover hay or silage is that it is often poisonous. If the hay heats during curing, coumarin (the compound which gives sweet clover its distinctive odor and flavor) may be changed to dicoumarin. This destroys the clotting power of the blood. Animals, cattle especially, fed on such damaged sweet clover hay, may bleed to death from scratches or dehorning. With this hazard, and so many other legumes available, there is little reason to depend regularly on second-year sweet clover for hay. It's worth more as a soil builder.

Sweet clover makes good silage, but you risk the same poisoning hazard. It should be wilted before

ensiling, and you should use a preservative.

Clearly, not everyone should grow sweet clover. The strictly livestock farm can usually use alfalfa to better advantage. Alfalfa will grow anywhere that sweet clover will, except on tight, poorly drained soils or on actual alkali soils.

Now, you may ask, "Where can sweet clover be grown?" The answer is: almost anywhere that the soil contains enough lime. No crop, not even alfalfa, is more sensitive to lack of lime in the soil. Always lime a soil that has a lower reaction than pH 6.0 if sweet clover is to be sown. In Ohio, the yield at pH 7.0 has been more than double the yield at pH 6.0.

Sweet clover will endure "tight" soils and poor drainage as well as alsike. For example, it can be grown, after heavy liming, on the "clay pan" soils of Missouri and Iowa, east to southern Ohio. It is the best crop known to reclaim subsoils bared by severe erosion, IF they contain enough lime.

Sweet clover needs fertility, too. Fertilizing a "soil-building" crop sounds silly to some, but no plant will add phosphate or potash to the soil.

As a catch crop, sweet clover is much better than other legumes. The reason lies in its habit of growth. Think of sweet clover as a *biennial root crop,* such as beets and carrots. Alfalfa and red clover live for several years, but bloom in the year they are sown if they are allowed to.

Sweet clover never blooms in the seeding year. Like beets, carrots, and other roots, it makes a good top growth, then stores materials in the roots until freezing weather. From September 25 to November, the weight of its roots doubles, while the top growth loses a little.

So, in the fall of the seeding year, sweet clover has about double the roots that alfalfa has and nearly three times the roots of red clover.

Because sweet clover roots also contain more nitrogen per pound than alfalfa or red clover, sweet clover is in a class by itself for plowing under in the spring after seeding. We have had as much as 175 pounds of nitrogen per acre in April, from sweet clover sown in oats the spring before. It has averaged nearly 100 pounds. This is as much nitrogen as is contained in 500 pounds of sulfate of ammonia.

If we let sweet clover grow for the second year, its advantage over red clover and alfalfa, in organic matter and nitrogen returned to the soil, largely disappears. However, it has a remarkable effect on soil tilth, not usually equaled in the same period by the other two.

Now, when should you plow under your sweet clover for soil improvement? Many persons think sweet clover must be allowed to make as much growth as possible in the second year before plowing for corn. But this is a mistake.

The early growth of second-year sweet clover merely takes materials from the roots to the tops. It is May before much new nitrogen is fixed, and by then it is time to plant corn. The sweet clover growth dries the soil and the heavy top growth may be unfavorable for corn, if a dry season follows.

In a time-of-plowing test in northwestern Ohio, on heavy soils where fall plowing is desirable, plowing sweet clover in November of the seeding year was better than any spring plowing. But if you plow it from August of the seeding year to any time before growth is well started the following spring, it won't be killed. It will grow and become a weed in the following crop. This is not so bad in corn, as the regular cultivation will take care of it. But in wheat, oats, sugar beets, soybeans, it may be a very serious weed.

A sugar beet man tells me he treats sweet clover with 2,4-D before plowing, then uses the field for sugar beets. He has no difficulty from growth of the sweet clover. Sweet clover is very susceptible to 2,4-D, and this treatment—probably ¼ to ½ pound 2,4-D acid per acre—should permit plowing under sweet clover before crops where it could not otherwise be used.

Because sweet clover is a highly specialized legume, good management pays off. It must be used in the right way. Many important points in your success with sweet clover rest on the fact that it never recovers from the crown after cutting, as red clover and alfalfa do. It makes new growth, if any, from buds along the stem.

In the seeding year, this means sweet clover *should not be clipped* after the wheat or oats is harvested.

When sweet clover is mowed after September 1, it makes no more top growth that season. The roots go through the winter the same size they were when cut. They may be so small that they heave easily. We have had 50 to 75 percent winterkilling by heaving of sweet clover cut September 15. The worst period to cut sweet clover is September 1 to 15. After this, the later it is cut, the greater the root growth, and the greater the value for soil improvement or pasture.

Even the height of combining is important. Sweet clover cut at three heights in July, nothing done after that, produced 1,100, 1,800 and 2,800 pounds of air-dry roots

per acre in November—following 2-, 8-, and 14-inch heights of cutting, respectively. Uncut sweet clover (the oats left unharvested) produced 3,600 pounds of roots in November. It is important to set the combine or binder as high as possible when harvesting grain above sweet clover.

Sweet clover should always be sown in small grain. Practically no farm is so free of weeds that, if sweet clover is sown alone, there will not be a heavy growth of weeds with it. Because these weeds can't be controlled by clipping without severe, almost fatal, injury to the sweet clover, it is far better to sow in small grain. This grain dies in midsummer in the Cornbelt—weeds seldom do!

What kind of sweet clover should you sow? There are two common biennial varieties, white and yellow. These are distinct species—they do not intercross. Most folks recommend the white, but the yellow has gained ground rapidly and is worth more attention than it has received. The white will produce more hay. It will provide more and later pasture than the yellow. So, for hay and pasture, the white is the best. But the yellow puts more material in the roots than the white, so for soil improvement, the two are equal. The yellow will establish much more certainly in dry seedbeds, so is best for any summer seeding, and for seedings in dry springs and dry climates generally. It is 10 days to 2 weeks earlier than common white.

In general, therefore, white sweet clover should be used whenever it is desired to cut hay in the seeding year or for any pasture use. Either white or yellow is used for soil improvement as a catch crop in a two-year corn-small grain rotation. Because yellow sweet clover is better in dry conditions, as we've said, it is generally better for seeding for soil improvement only.

Three important diseases affect sweet clover—root rot, black stem, and mosaic. No treatment is known for any of them, and breeding for resistant varieties is the only known hope for control.

A new threat to sweet clover is the sweet clover weevil. It is a tiny, gray snout-beetle, about one-fifth of an inch long. It feeds almost exclusively on sweet clover. The recent drastic drop in sweet clover acreage is due largely to this insect. It eats characteristic notches in the edges of the leaves. This leaf damage is easier to find than are the beetles! They drop to the ground when disturbed, and hide under loose trash at the surface.

Their feeding on second-year sweet clover is not usually serious, but they may destroy stands of newly sown sweet clover *as soon as it is up.*

No problem in sweet clover culture today is more important than working out successful methods for the control of sweet clover weevil. DDT will control sweet clover weevils if it reaches them. But economical methods and times of application have yet to be completely worked out. Until we can run more tests, you'll have to experiment a bit yourself. All we can say is keep a close watch, and dust or spray by your own judgment.

That may sound a bit risky. But sweet clover is worth working for.

Plow, Pack and Plant at the Same Time

Most of us are a little too ambitious when it comes to putting in our crops. A single, "once-over" operation—plowing, packing, and planting—would be a lot easier. And Michigan soils men say it isn't a bad idea.

The tried several methods of seedbed preparation for corn, sugar beets, and small grains, including disking and spring-tooth harrowing.

Results: yields with the once-over operation were just as high as those obtained by going over the field half a dozen times with almost that many implements.

In addition, the once-over method had these advantages:

Quicker (Less time was required to get the seed in the ground.)

Cheaper (It eliminated two diskings and two harrowings.)

Fewer weeds (They didn't get a head start on the crops—were easier to control.)

More moisture (Soil was able to store up more water.)

These experiments were run on a clay loam soil. Because it was loose and grainy, with good tilth, the seeds didn't have any trouble reaching water, plant foods, and air.

If your soil is hard to work and lacks texture, this once-over method may not work as well as it did in these tests.

But that doesn't mean that you should use more implements. Excessive tillage destroys tilth. What you need is more organic matter to build tilth and make the soil loose and grainy.

Growing plenty of well-fertilized legume-grass mixtures is the best and cheapest way to keep your soil in good shape.

—Farm Journal

Good Oil Pays Dividends

Condensed from The Ohio Farmer

T. P. Christen, Jr.

YOUR modern tractor wouldn't last long if you used motor oil made the way it was made fifty years ago. Tractor motor oils have advanced just as have the tractors.

Let's just take engine weights as one measurement of tractor progress. The engine of the 1927 McCormick-Deering 10-20 weighed 1050 pounds complete with engine accessories. It developed slightly better than 19 horsepower at the drawbar. The 1950 International Harvester "H" engine weighs approximately 650 pounds with comparable engine accessories and develops better than 24 drawbar horsepower. The same is true in other makes and models. In other words, engine weight per drawbar horsepower has been greatly cut.

This weight reduction has been made possible largely by increased compression ratios. Fuel savings, more power, and less initial cost are the results. Higher compression pressures make higher engine temperatures where motor oil must do its job. So oils have been constantly improved.

Fifty years ago motor oils were straight mineral oils. The oil of today is made of better quality base mineral oils together with a number of additives. Each additive serves a different purpose.

One of the first additives to be developed was what is called a "pour point depressant." Ordinary mineral oil will thicken like molasses at a temperature of zero. By adding the pour point oil depressant winter oils can be made to flow at 30 below zero.

Because of high temperatures at lubrication points in the engine, today's oil must be protected against oxidation. Oxidation is a process of any material combining with air. Unprotected oils would do just that. An additive to protect against oxidation has been developed and is being used. Oil men call it an antioxidant.

To lubricate an engine we must maintain an oil film between the piston and the cylinder walls. Temperatures on the cylinder wall average 325° F. That's pretty hot! All oils have a tendency to thin out when heated. The trick is to keep the oil from thinning out

Reprinted by permission from The Ohio Farmer,
Cleveland, Ohio, March 4, 1950

so much on these hot cylinder walls that the oil film is destroyed. Once the oil film is destroyed we have an average of only ten minutes engine operation before failure results. Additives have been developed to reduce the thinning of oils at high temperatures. In high-quality oils they are being used.

Another additive is a detergent. Today we all read about modern detergent oils. A detergent oil exerts a cleaning action inside the engine. There are two types—the mild detergent and the high detergent. Many of our premium quality motor oils are mild detergent oils. This oil contains a small amount of detergent. The amount of detergent added to the oil is small compared to the other type or high detergent. The mild detergent type may be placed in any engine under any condition of cleanliness with no ill effects. With regular oil drains it will clean the engine and keep it clean.

The high detergent type oil is usually labeled Heavy Duty or Diesel Oil. This oil is made to government specifications, and is tested on a 500-hour diesel engine run. The engine must be in good running condition after the three-week non-stop service under high load and abnormally high engine temperatures. That's pretty tough operation for any motor oil!

The high detergent oil is recommended for diesels, trucks, buses, and farm tractors. These operations are considered "tough" and usually derive benefit from the Heavy Duty type oil. HD oils must be used properly.

Many tractor manufacturers now devote considerable space in their operators manuals pointing out the advantages of using HD oils and also directions for their use. An engine must be relatively clean before it is changed to HD oil. There are two ideal times to start using this type of oil. The best time to begin is when your tractor is new. However, when your tractor is older, the proper time to begin using HD oil would be immediately after an overhaul.

A dirty engine may be flushed before using HD oil or a series of quick changes of the oil itself may be used. By that we mean three oil changes about ten hours apart, using the HD oil itself as a cleaning agent. Thus the engine is cleaned gradually and safely. Another possibility is the use of a mild detergent oil for several months before a complete change to HD. Once again the engine has been cleaned gradually. Always drain engine oil while hot. The danger involved in placing HD oil in a dirty engine is that the cleaning action may take place so fast that sludge may clog the oil pump screen. When properly used, HD oils give better results in tractors because:

1. They clean dirt from inside the engine.

2. They hold this dirt in suspension. When the oil is drained, the dirt comes with the oil.

3. They soften this dirt to consistencies that cause no additional wear even though the dirt is circulated in the oil.

4. They resist higher engine temperatures.

HD oils should be used in the same viscosities as recommended in the operator's manual. They may be expected to darken in color sooner than conventional oils because they are constantly picking up engine dirt and holding it in suspension. Common type tractor oil filters may be used with HD oils just as with any other type oil. Oil filters are always helpful in prolonging engine life. They should be changed regularly just as should the oil.

There is one other type additive used in motor oils. It is an anti-foam agent. It does just that. It is usually placed only in the high detergent type oil to prevent foaming. It is the same agent that is used in gear oils to reduce foaming.

Different price oils vary in quality. Cheaper oils usually contain few of the additives just described. Premium oils cost more. They contain the best quality base stock plus most of the above additives.

It usually pays real dividends to use a high quality oil in a modern tractor. Oils have progressed in quality in order to keep in step with progress of the tractor engine. Thirty years ago almost any oil would do. Today our tractors take the best.

Poultrymen Try This

Examine your chicks when they bed down at night. How are their crops—some full, some half full, some practically empty?

Now try this: Remove feeders one and one-half hours before chicks bed down, and one hour later put them back. Then the birds will stuff themselves.

Examine the crops. Every bird will have a crop like a baseball, and in the morning, all crops will be empty. During the night, the birds will have assimilated all of the feed.

These birds will gain much faster than birds which bed down with a crop one-half full.

—A. L. Bartlett

Sire Efficiency

Condensed from Guernsey Breeders' Journal

George W. Trimberger
Cornell University

THE importance of a sire in maintaining high breeding efficiency among females in a dairy herd cannot be overemphasized, though responsibility for a good conception rate rests with both. In order to have bulls of maximum usefulness, the dairyman needs to give attention to two things—early handling and the everyday management practices used with the animals.

Because the sire has such an influence on herd fertility, it pays to raise a young bull so he produces high quality semen at an early age and to keep him in this condition for as many years as possible. A bull with high fertility is valuable in many ways. When he is mated with females of high fertility an excellent conception rate is obtained. Even when mated to low fertility animals, he can produce an average record. (In contrast, low fertility in one sex, combined with low in the other, gives very poor breeding results.

Another advantage from an exceptionally fertile bull is that he can usually eliminate or greatly reduce the problem of difficult breeders in a herd. More and more importance is put on the fertility level of the sire when there are troubles in breeding some females. Many breeders with large herds keep one bull of exceptional fertility to use on difficult cows. The use of such a bull often is justified even if he doesn't possess as good a pedigree as other bulls in the herd.

To have and keep bulls with high breeding efficiency, any dairyman can follow certain practices. Here are some pointers.

The usefulness of a bull throughout his lifetime may be influenced to a marked extent by the way he is handled during the first several years. Every bull calf that is worth raising for either sale or herd use should have an individual pen from the time he develops the urge to ride or jump other calves. Usually this is at six months of age under a normal feeding regime. Keeping several young bulls in a pen should be avoided, as sexual excitement without use at this young age is

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Peterborough, New Hampshire, March 1, 1950

very detrimental. It increases the amount of feed needed to bring about normal gains, and it may have a definite influence on type characteristics in the animal.

A young, growing bull calf should have plenty of exercise to develop his body muscles, keep the proper muscle tone, and develop sturdy and straight body lines. When young bulls are confined in small individual pens, it is often desirable to have individual exercising lots outside or to have some kind of a mechanical exerciser.

Another important management procedure is to train the young bull calf to lead and show. Confidence gained during this early development period will usually be remembered throughout the bull's life. Leading a young bull calf to water and feed, to an exercising lot, and later to serve cows is an excellent way to get the confidence of a suspicious and restless growing calf. Many large breeders consider this so important that they have one man devote most of his time to leading and training young bull calves.

A properly handled young bull will usually keep his good manners so he will not be such a disagreeable fellow when he grows older. When this is the case, his owner will not try to trump up excuses to sell him for slaughter at an early age. Unfortunately a valuable sire that has been poorly handled may be discarded because of bad conduct before his heifers have come into milk and shown how valuable he is in transmitting ability.

A bull should receive his early training and have continuous handling until he is at least two years of age if he is worth enough to stand at the head of a herd. At one year of age, a small ring should be inserted into his nose. This is easy to do with an old trocar and canula. The small ring should be replaced with a large heavy ring a year later. Often a good approach for gaining a bull calf's confidence in man is to curry and brush him.

A common mistake in raising young bull calves is failing to provide enough feed. The quality and kind of feed for a young bull calf is the same as for a heifer calf except that he needs more of it. Young bulls are larger and grow faster so they have a higher feed requirement than heifers. This applies to milk feeding and also to grain feeding. At six months of age, the bull calf needs twice as much grain as does a heifer calf. When the bull reaches a year of age, the daily grain allowance may even have to be more liberal than this. There is so much individual variation among bulls, both young and mature, that feeding rules for bulls are not as useful as they are for heifers and cows.

Whenever a young growing bull does not get sufficient nutrients,

he will be undersized and reach sexual maturity at a later age. Such bulls are more apt to produce semen of poor quality. Often they are lacking in sexual desire or drive and thus are poor servers or they may not serve at all. With an older bull this isn't such a problem because, even on scanty rations which do not provide the required nutrients, he is much more likely to produce semen of satisfactory quality than will a young sire. This has been demonstrated by vitamin and other deficiency experiments with aged sires.

If a young bull is not properly fed to reach normal size, it is difficult to sell him. If he is undersized and stands at the head of a herd, he makes a poor impression. From a heredity standpoint, it is impossible to determine whether the small size of an underfed bull is due to genetic or environmental factors.

During recent years, feeding experiments with older bulls have not indicated any necessity for stressing variety of proteins or additional vitamins in a practical ration. The feeding of a high quality mixed legume-and-grass hay or legume hay along with sufficient grain to keep the bull in a desirable breeding condition is recommended. He should not be too thin nor too fat, but in a thrifty condition. It is well known that a well-fed cow, kept in good condition, is the most efficient and persistent producer; and it is entirely possible this applies to a bull for high quality semen production.

Many breeders have had the aggravating experience of spending an hour or more with a bull before he serves the cow. Sometimes interest is so low, especially in older bulls, that they will not mount the cow. Others will mount but will not serve. It is not advisable to leave a cow with the bull if he is a slow server because there's no way to know whether or not the cow actually was served.

Bulls may lack sexual drive or be poor at serving for a number of reasons. Young bulls may be underfed, resulting in slow sexual maturity. Older bulls may have sore feet which need trimming or they may have an injury; some are too fat or too thin, or have developed too much barrel from eating large quantities of roughage; still others may lack the proper hormone secretions in their body system.

Often these situations can be remedied by correcting the management procedure. If the feet are sore, they should be trimmed and treated. Regular and sufficient exercise should always be provided. A mechanical exerciser may be the answer. Many bulls will lose their drive if kept tied in a stall without exercise. However, others will maintain good breeding form and high fertility while they

stand in a stall all season. A breeding chute may be beneficial for large bulls.

Bulls with too large a barrel can be put on a feeding schedule to change this aspect of conformation. From methods used at Cornell, it appears desirable to bed the bulls with shavings so they will not eat the bedding. The hay provided should be of exceptionally high quality so only a limited amount has to be consumed to furnish the required nutrients. Never should the bull be given coarse or stemmy hay refused by the milking cows. In some cases, it helps to replace part of the hay with grain; this furnishes the required nutrients in less bulk. Sometimes it is an advantage to feed 25 to 30 pounds of silage daily to slow breeding bulls since it is a succulent feed. However, it probably is advisable not to feed large quantities although a few dairymen get away with it.

Another helpful management procedure for slow serving bulls with too much barrel development is to withhold most of the water and the roughage feed during the early part of the day until the cows are served. The grain can be fed in the morning along with a limited amount of water given from a watering pail. This will keep the bull in shape so he can stand the work involved in serving the cow.

If sluggishness persists after these feeding and management procedures have been tried, it is possible to use either hormone therapy or the feeding of a specific drug. The hormone treatment consists of having the veterinarian inject the gonadotrophic hormone (Gonadin). The drug which the veterinarian can prescribe as specific to correct this condition is a daily dose of five grams of Chlorobutanol, also sometimes called chloretone or trichlorobutyl alcohol. The bull can be given five grams of this in the feed or in capsule form for an indefinite period. However, 10 grams of the powder will soon cause him to stagger. Giving this in capsule form is much more satisfactory as it eliminates any possibility of the bull not taking his daily allowance.

Some times it takes an evaluation of semen to find the cause for low fertility in a bull. The artificial vagina provides the means for proper evaluation. Ranked according to importance, the best characteristics for evaluating semen quality are motility, concentration and shape and size of sperm cells.

Good motility is essential for high fertility, but does not guarantee it since some bulls may be low on fertility when their semen shows sperms of high motility. However, low motility always indicates low fertility. About 70, 80,

or 90 per cent motile sperms is very good; usually any percentage above 50 per cent is acceptable.

For desirable concentration, the semen should contain about 800 million to a billion or more sperm cells per cubic centimeter. A bull with this normal concentration ejaculates about five billion or more sperm cells at each service. For routine artificial breeding, usually 15 million of these tiny cells are injected. This makes it possible for 300 to 400 females to be bred with the semen from one service of a bull.

In checking shape and size, observe cells for normal morphology. Approximately 80 per cent or more of the cells should be found normal. Usually a bull with 50 per cent or more will have an acceptable breeding record so he can be kept in service, especially if he is a valuable sire. However, as he approaches this level, he becomes very marginal in his results.

Since the artificial vagina has come into use, it has been possible to check accurately on bulls with poor breeding records and observe many cases of abnormal semen production. For semen lacking in concentration and semen with too many abnormal sperm cells, no satisfactory treatments are available for consistent and reliable responses.

However, low motility can be corrected by hormone therapy or treatment by the veterinarian. The treatment with 30 cc. (1500 units) of Gonadin gives a remarkable demonstration of how dependent the reproductive functions are on the hormones or glandular secretions in the body. This treatment seldom fails to bring about a response. It is almost amazing to take semen samples from a bull over a period of time and consistently observe the low motility; then 10 days after the Gonadin hormone is injected into the gluteal muscle (located between the hips and pin bones in the pelvic region) marked improvement invariably is seen in a sample from the same bull. Usually the motility will be about normal.

In about half of the cases treated, a permanent response is obtained. The other half will remain up for several weeks or longer and then drop again. Such bulls will respond for a period of several years to treatments and finally give less and less response. The offspring from such bulls will usually be grouped to coincide with the periods of treatment.

The trouble, when low motility is present, evidently is deep seated because using extra large amounts of semen does not correct the situation. Evidently the motile sperm cells which are present do not carry the punch for a high conception rate.

Any management procedure which has an effect on the enzyme and hormone system in the bull,

may be beneficial to partially or entirely correct this condition by boosting the percentage of motile sperm cells. Such procedures include exercise and use of high quality roughage or pasture.

Recent research has provided help for bulls of low fertility caused by the presence of an infection in the reproductive tract. The use of antibiotics or germ killers with artificial insemination is now in general practice. At first, sulfanilamide was added to the semen to act as an antibiotic. Additional research pointed out the superiority of streptomycin and penicillin. These two antibiotics are used together because each one attacks a different group of harmful organisms, making them much more effective when used in combination.

The use of antibiotics in the semen will often increase the rate of conception by five per cent for bulls of relatively high fertility. It may increase it as much as 25 or 30 per cent when added to the semen sample from bulls of low fertility.

Obviously, since low fertility can be due to many causes, not all bulls with low fertility will benefit from the use of antibiotics. However, information now available indicates that about half of the bulls in this category will give a favorable response from the use of antibiotics.

If it is suspected that a reproductive infection is present in the herd, females should not be switched or rotated from one bull to another for natural breeding. Otherwise, this practice provides ideal conditions to spread the infection from one bull to another through the female.

The cow previously bred to an infected bull can act as a carrier of the infection to infect the next bull that is mated to her. A study of the breeding records will usually indicate how serious this condition is within a herd.

The breeder can use a very practical management procedure to help in eliminating trichomoniasis and contagious granular vaginitis from a herd. Usually these diseases are spread through the bulls at the time of service. The bull becomes infected by serving infected females and is a spreader thereafter. But the fortunate thing is that ordinarily a female will be free from these diseases after a normal full-term calving even though previously exposed to an infected bull. Therefore, whenever either of these diseases or others are suspected in a herd, a practical procedure is to get a clean bull; then use him either entirely by artificial breeding or use him only on virgin heifers and on cows that are bred for the first time following a normal calving.

Cows previously bred to the bull that apparently carries the infec-

tion should be bred to him until they conceive. If such a bull has too poor a breeding record, then another bull that is on his way to the stockyard can be used to breed the exposed females. As a rule, it is recommended that females previously exposed to an infected bull be given three free heat periods without service; then they are switched to the bull used only on the females suspected of infection because they were served by an infected bull. Once a cow conceives and calves normally, she can be bred to the clean bull.

This practical procedure has been used extensively with good results. Dairymen should consider using it when they see evidence that females are becoming infected following service to a particular herd sire. If the herd is not large enough to justify keeping several bulls for a time, then artificial insemination can be resorted to for the cows which have been previously bred to the infected bull until they conceive and go through a normal calving.

In working for high conception rates, the breeder can usually divide the responsibility for a high breeding efficiency between the herd sire and the females. A proper emphasis on high fertility produces a marked improvement in breeding operations within a herd. And this is reflected in greater economic returns.

Toxaphene Gets Cutworms on Corn

Condensed from Iowa Farm Science

J. H. Lilly
Research Professor of Entomology
Iowa State College

A NEW insecticide called toxaphene is your best bet for effective control of cutworms in corn this year. Both college and on-the-farm tests last year showed that toxaphene means death to cutworms.

While cutworms forced Iowa farmers to replant an estimated 800,000 acres of corn in Iowa last year, not a single failure was reported from the hundreds of acres treated with toxaphene. Treatment results were certain. What few cutworms weren't killed outright by treatment seemed to get sick and stop feeding. But an estimated 90 percent just stopped living.

Toxaphene treatment isn't ex-

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Ames, Iowa, March 1950

pensive. It's easy to use. It doesn't seem to harm the corn. Supplies should be ample if you order early.

But most important, toxaphene is effective—not only against cutworms but also against webworms.

You may never see many cutworms in your field. Most of them stay hidden in the soil during the day. It's the damage they do that tells you they're around. Cutworms like to eat, and they eat plenty. As implied by the name, cutworms simply cut down the plant they're using for feed. That puts the plant out of action just the same as if someone went into your field with a pair of shears and started clipping.

Corn is more vulnerable to cutworm damage than most other crops for several reasons. First, there are fewer plants per acre in a corn field than there are in fields of many other crops. Then, unfortunately, we just "invite" the cutworms to eat our corn plants by cultivating out the weeds—leaving only the corn plants for the cutworms to feed upon. Each plant which cutworms cut below the growing point is finished.

Cutworms usually launch their attack in blitzkrieg fashion—fast and without warning. When that happens, you have to act fast or replant.

Earlier recommendations for cutworm control weren't very satisfactory. Poison bran often gave poor kills. DDT sometimes gave little or no cutworm control. In fact, some farmers thought that DDT acted as little more than salad dressing for the cutworms. Chlordane has failed to give consistently good results in cutworm control.

When cutworms started hitting Iowa corn crops last year, we thought DDT was the best thing to use. But we continued tests with both standard and purified DDT, toxaphene, chlordane and BHC.

Toxaphene led the field from the first tests. We quickly changed our tests from small plots to field trials. We believed the early results justified our making a tentative recommendation for statewide use of toxaphene for use in cutworm control in corn.

When using about 2 pounds of actual toxaphene in as little as 2 gallons of spray per acre, the results in farmers' fields were convincing. Of the hundreds of acres treated, not a single failure was reported. That 2-pound application is our present recommendation. Experience may show that a lighter application may be practically as good.

You can apply toxaphene by adjusting your weed sprayer to concentrate the spray right along the rows. That's where it'll do the most good. Theoretically, you may be able to get by with only 1 pound per acre by spraying that way since it puts most of the spray where it's needed. Broadcast spray-

ing, of course spreads the spray over more area. A higher dosage of toxaphene may then be necessary to make sure you get enough of it in the right places. Cost of the material for application at the 2-pound rate is expected to be about $2 per acre this year.

Sometimes you'll find webworms in corn—working alone or "cooperating" with cutworms. Webworms live in a self-made armor of silk in the soil at the bases of plants. They, too, can damage corn severely. They're harder to control than cutworms.

However, if you treat your corn with toxaphene for cutworm control, chances are you'll get the webworms, too. Toxaphene isn't quite as effective against webworms, but the results obtained are worthwhile. It seems to make them sick so they stop feeding.

With some control methods, there may be trouble if there's rain right after you've sprayed. But in controlling cutworms with toxaphene, the results seem to be effective even after a rain. That may be because the cutworms live in the soil and it doesn't matter whether they run into the insecticide on the soil or plant, or down in the soil where rain may take some of it.

Here's a situation that we found on one farm: A farmer sprayed a 14-acre field on May 30 and another 26 acres on June 1, both with 2 pounds of toxaphene per acre. It rained about 1½ inches 2 hours after the June 1 spraying was completed. Still, the kill of cutworms was excellent in both fields. In 1948, this same farmer had used 5 percent DDT dust at the rate of 100 pounds per acre and obtained no cutworm control.

It doesn't seem necessary to work toxaphene down into the soil after the field has been sprayed. As already pointed out, it doesn't make much difference where the cutworms run into the toxaphene just as long as they do it.

Is toxaphene the final answer? We can't say. Although it gives exceptionally good results for cutworms in corn, it hasn't been carefully tested on other crops. And, even the results on corn were obtained in one state in only one season—last year's. We can't draw final conclusions about a recommendation until it has made good for several years and under different circumstances.

For these reasons, we don't say toxaphene is the last word. The best methods now known may be improved as the science of insect control moves forward. But this year's corn isn't going to be able to wait if cutworms and webworms move into your fields. That's why we say until something better is found, toxaphene is your best bet to hold cutworm and webworm damage down in 1950.

The World Is Our Nursery

Condensed from Foreign Agriculture

Dr. Lewis P. McCann
U. S. Plant Introduction Garden

AGRICULTURE in the United States began as a blend of the Indian and the European, and over the past 300 years is has been enriched by contributions from the whole world. Every major crop grown in the United States today is an immigrant. Plants that colonists brought from their homelands and those that were gathered by ship captains, missionaries, consuls, and plant explorers have been adapted to our varied climates, conditions, and needs, first by trial and error and later by planned experiment.

This blend of the world's agriculture is a highly successful one. It has given us a $125 billion agricultural industry, made us the best-fed people in the world, and given us the means for repaying, in food and technical assistance, those nations from whom we have borrowed.

Since 1898, when plant introduction was formalized as a distinct unit of the Federal Government, 185,000 collections have been received and numbered. Of these, about 80 percent are familiar crops on American farms and many others are still in the testing stage. Outstanding examples of these plant immigrants that we have adopted are soybeans, alfalfa, and lespedeza.

Soybeans came to us from southeastern Asia by way of consuls, missionaries, seedsmen, and plant explorers. Most of the types now grown were brought in 20 years ago by two of the Department of Agriculture's plant explorers. Their 2-year expedition cost American taxpayers $50,000. In return for this investment the United States has a new industry valued at more than a billion dollars a year. Soybeans alone have already repaid many times the total cost of all our plant introduction work.

Soybeans, grown principally in the Corn Belt, are one of the most versatile products from the American farm. They are used not only as feed and as food, in margarine, shortening, and flour, but also in such products as plastics, soap, paint, and synthetic rubber.

Alfalfa is another famous plant

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Washington, D. C., March 1950

immigrant from Asia that we have come to think of as American. It came to us in two ways. Easterners going to California by way of the Horn during the gold rush got alfalfa seed in Chile, where it had come from Spain. They found it suited to their new land, and it quickly became a popular forage crop.

At about this time, Wendelin Grimm, a German immigrant, planted in Minnesota alfalfa seed that he had brought from his homeland. This was our first winter-hardy variety.

Half a century later, alfalfa was growing on 12 million acres of farm land, but it was beginning to die out after 2 to 4 years from bacterial wilt. Department plant explorers began to search for resistant strains in areas where alfalfa had been growing for thousands of years—in western China, northern India, northeastern Iran, and Turkistan. They found several with which plant scientists worked for years to develop the well-known Ranger variety that has good forage qualities and is resistant to cold and wilt.

Another expedition in the mid-1930's brought home a new kind of alfalfa from northern Turkey—a single plant that spreads over an area of several square feet of soil by sending up shoots from underground rhizomes. This new alfalfa promises to be highly important as a pasture mixture and hay.

To farmers of the southern Mississippi Valley, the lespedezas are the most important of the plant introductions. The two annuals, common lespedeza and Korean, excellent soil-improving cover crops, have revolutionized agriculture over 20 million acres of that area. Korean lespedeza, for example, was bringing an annual income of $120 million to southern Mississippi Valley farmers 30 years after its introduction.

Nobody knows how common lespedeza came here from Asia, but it was growing in the fields and along the roads of Georgia a hundred years ago and is now found as far west as Missouri.

Korean lespedeza was introduced by plant explorers, first as a half-ounce package of seed from Korea. Its adaptability and hardiness soon made it popular and extended the use of lespedeza as far north as the Great Lakes. We now have about 40 million acres of this species in cultivated and pasture lands.

Not all of our plants emigrated from Asia, of course. Ladino clover came from Italy, and strawberry clover from France. The Washington navel orange was introduced from Brazil, and ancestries of most of the new corn rust-resistant oat varieties can be traced to Department introductions from South America and Australia.

The first introductions came from Europe with colonists who

settled in this country more than 300 years ago.

They planted crops that they needed for food and feed in natural clearings and on land that they cleared. Their prinicpal crop was Indian corn, but grain that they had brought from home was also planted—wheat, rye, barley, oats, buckwheat. They had little livestock, but all that they had except turkeys came from Europe.

From the Indians these early colonists borrowed not only maize but also sweetpotatoes, tomatoes, pumpkins, gourds, squashes, watermelons, beans, peas, grapes, berries, pecans, black walnuts, peanuts, maple sugar, tobacco, and cotton.

The first evidence of a change in the character of agriculture came about the time that the Dutch colony of New Amsterdam became the English colony of New York in 1674. Farmers began to specialize in certain crops and buy those that they did not raise. Wheat became a staple crop with rye and barley secondary in importance. Indian maize, for the hogs and horses and somewhat for meal, was raised after the fashion of the Indians. Though their crops had more variety, in culture, harvesting, and threshing, the colonists were not much advanced beyond Biblical times.

Throughout the eighteenth century, little or no attention was paid to farm animals or to their feed or forage. The animals foraged and browsed for themselves through the scattered clearings and almost continuous forests. The lack of grass was perhaps the greatest handicap of the early American farm, and this led to the importation of timothy, bluegrass, and clover.

Colonists also brought fruit with them and found new kinds here. As trees matured from seeds brought and planted by immigrants, fruits of European origin such as apples, pears, peaches, and cherries were found in the dooryards of most of the early American homes. The native fruits—blueberries, huckleberries, cranberries, grapes, strawberries, raspberries, blackberries, and dewberries—were left undomesticated and collected from the wild. Indeed, most of these fruits are still collected from the wild, but selections have been made and plant breeders have produced many superior varieties from the wild fruits that are now commercially available.

Not until just before the Revolutionary War was any thought given to the possibility of replacing seedling fruit trees with improved budded varieties. One of the first commercial nurseries to be established in the colonies was the Linnaean Botanic Garden founded by William Prince. In 1771, Prince advertised a number of budded materials for sale, listing 24 apples,

9 apricots, 18 cherries, 12 nectarines, 29 peaches, 42 pears, and 33 plums. Only 3 apples of the group were originated in America; the remaining fruits were from Europe.

The white potato, now regarded as our most important vegetable, came from South America. Although early Americans grew it for home use, it was not considered a salable crop until after 1800. Beans were grown in home gardens but were not sold commercially. Most vegetables were grown for immediate home consumption. The perishable nature of the vegetables and the lack of transportation, handling, and marketing facilities did not encourage production for sale.

Ornamental plants were not congenial to pioneer life. There was little time to devote to the aesthetic after the work in the fields, forests, and kitchen was done at the end of the 6-day workweek. Sundays were actually consecrated as days of rest. As some individuals accumulated capital goods that permitted some leisure, flower gardens began to appear. Hollyhocks, pansies, tulips, pinks, marigolds, daffodils, and sunflowers were found around the homes, and seeds could be obtained from stores and by exchange.

After the Revolution when social and business life changed from itinerant and nomadic pioneering to settled community life, farming as a business enterprise began. Gentlemen farmers such as Washington and Jefferson were instrumental in spreading interest in variety trials of all crop plants. Soon many individuals began to recognize the importance of agricultural improvement. Especially emphasized was the introduction of certain kinds of plants and seeds from Europe.

As early as 1792 the Transactions of the Society for the Promotion of Agriculture, Arts, and Manufactures for the State of New York show that recommendations were made to the New York Chamber of Commerce that ship captains sailing from the port of New York be requested to "Procure a small quantity, not exceeding one quart, of those kind of grain which make the principal food of the inhabitants, and this even though it should be wheat, barley, rye, oats, or maize; for though these grains are common in this country, yet there are varieties which may be extremely important, as was instanced in the accidental introduction of the white-bearded wheat, which was found to resist the insect when every other species was destroyed by it." The request reads further to include "pulse and legumens . . . seeds of the species of grasses . . . cattle used for food or draft . . . breed of sheep . . . and land or water fowl."

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Government participation in plant introduction was slow. Agriculture in general was regarded as an individual problem. As the number of farms grew and as the demand for more and better agricultural produce increased so did the recognition of public officials in the importance of plant introduction.

In 1827 President John Quincy Adams directed all United States consuls to forward to Washington rare plants and seeds for distribution. Twelve years later in 1839 Congress passed its first appropriation for agriculture. The sum of $1,000 was allocated to the Patent Office to be used for collecting and distributing seeds as well as for statistical and other investigation. From this humble beginning the affairs and problems of agriculture increased until 1862 when the Department of Agriculture was organized as a separate branch. The demand and interest in plant introduction continued to increase until 1898 when the Department of Agriculture created a separate unit known as the Office of Foreign Seed and Plant Introduction. This Office has been maintained throughout the years with some changes in name and administrative jurisdiction but with little change in scope and procedure.

The office now known as the Division of Plant Exploration and Introduction is administered through the Bureau of Plant Industry, Soils, and Agricultral Engineering. Though the Department of Agriculture has outgrown its first appropriation in terms of money and purpose, the need that brought about the first appropriation has not lessened nor has plant introduction been curtailed. Rather, the work has been intensified just as our agriculture has become intensified.

Agricultural development during the twentieth century of intensive and extensive crop production has introduced new problems and needs for new plants. Not only do we need new plants but we also need new genetic characters to be found in the wild ancestors of our cultivated plants in order to combat disease, insect, and environmental problems. Plant exploration has become a diversified yet specialized business to service the demands of the research men in plant pathology, breeding, physiology, agronomy, horticulture, and other fields of pure and applied botanical sciences. Recent research in the hormone field and antibiotics has indicated that the plant world is practically untouched from the standpoint of extracting phytochemicals for the treatment of human diseases and for general use as antibiotics.

The present plant introduction and testing program offers the States and the various plant agencies of the Federal Government an

opportunity to coordinate the introduction and evaluation of new material on a much broader and more thorough basis than has been possible before.

Funds were made available to the Division of Plant Exploration and Introduction during the fiscal year 1948 to establish a national cooperative project for introducing, testing, evaluating, and preserving new plant materials.

Since the beginning of this project, five different foreign expeditions have been in the field collecting plant materials in Argentina, Brazil, Guatemala, India, Mexico, Turkey, and Uruguay. Plant accessions from these expeditions number well over 12,000. About 2,000 are being tested in various cooperating experiment stations throughout the Northeast and North Central regions and a large backlog awaits space and facilities in the West and in the South. It is much too early to list any specific finds from the expeditions.

The introduction of plants for industrial uses involves not only the usual horticultural and agronomic tests but also the added problems peculiar to making produce into a product. Many questions arise. For example, are the costs of production prohibitive? Many crops can be grown successfully in the United States from the agricultural point of view. Pyrethrum can be produced successfully in Pennsylvania, but costs of land, labor, and processing are too high to compete with the lower costs in Japan or Kenya Colony in Africa. Certain fiber crops can be grown within the continental United States, but hand labor for decorticating runs the cost beyond those of Pakistan and India. Plant breeding and new types of machinery might serve to lower costs to a competitive level or war might make production costs insignificant, but under normal conditions we cannot afford to grow pyrethrum flowers for insecticidal use or fiber plants for our bagging, binder twine, carpeting, and cordage.

Over a period of about 300 years, our agriculture has expanded to a point hardly envisioned by even the most forward looking of our founding fathers.

There is reason to believe, however, that our present methods of production and the quality and quantity of our food and agriculture will be changed as the world continues to be a smaller place in terms of transportation and political access. Ravages of disease, insects, and climate are always working against us. We must continue to look for new germ plasm that will give plants resistance to new diseases and insects. We are a quality-conscious nation —and we must continue to look for those quality factors that meet the increasingly high standard of our consumers.

Farm Crop Driers

Condensed from Electricity on the Farm

CROP driers are becoming of ever increasing interest as money-making farm equipment. The reasons are simple. The artificial removal of moisture produces crops of higher grade and greater feeding or money value. It saves rain damage, spoilage and field losses. It takes care of that excess moisture in combined grains and permits corn harvesting early enough to get a better price and a following crop.

The list of crops being dried on the farm is increasing. Here are some of them:

Hay—Dehydrated and mow finished
Combined grains and sorghums
Corn—Hybrid seed and market corn
Rice
Tobacco
Sweet potatoes—Curing and dehydrating
Fruit—Prunes on West Coast
Hops
Walnuts—West Coast
Tung nuts —South
Peanuts
Dry beans
Onions
Flower bulbs

We speak of curing tobacco, dehydrating prunes, drying hops or grains and dehydrating or mow-finishing hay. With all of these processes and crops, it is a matter of removing excess water. We just do it a little differently for different crops to get the best and most economical results for that crop. Sweet potatoes need a curing period of about ten days at 85° F before being dropped to 50°–55° for storage. Prunes must be dried quickly to avoid fermentation, but at a low enough temperature so they will not caramelize. Walnuts get rancid and hops lose quality if overheated. On the other hand, some hay is dehydrated at temperatures as high as 1500° F.

Moisture is removed (1) by air movement over and through the crop; (2) by heat; (3) by air and heat together.

Air movement in crop drying equipment is usually created by fans or blowers. In some cases, heat alone is used. Prunes, hops and walnuts were formerly dried in natural draft driers. The "draft" was created by the heated air which is lighter than cool air and rises up through the trays or bins. It was later found that

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New York City, New York, March 1950

adding a fan to help circulate the air increased the efficiency of the process and gave the operator better control of the product.

Heat in crop drying is not used primarily for increasing the temperature of the product. What it does do, in addition to making the air lighter, is to increase its moisture-holding capacity. Roughly, the moisture the air will hold is doubled for each 27° F rise in temperature. Air, when heated, will therefore take up more moisture from the crop.

With these facts as a background, let us size up a few crop driers.

Fruit and vegetable processors have their dehydrators pretty well standardized after years of experience. The crop is placed on stacked trays in an air tunnel. Heated air is blown through and over the trays. It is not uncommon to find 20 to 40 horsepower in fan motors on one fruit farm.

To most of us who are not specialty farmers, crop driers mean equipment for drying hay, grain, rice, and corn. The same equipment can and is being adapted to curing tobacco, drying peanuts and beans. It could be used for nuts and hops.

Twenty years ago, there were no mow hay finishers. But there were a number of different alfalfa dehydrators, some of them fantastic arrangements of pipes, heaters and blowers. Survivors in this field of quick dehydration are a few Mason or Fulmer type tunnel dehydrators, the Ardrier and a few rotating, single drum driers.

The tunnel driers were up to 200′ in length with moving conveyors carrying the mattress of hay, and with blowers and coal or oil burners supplying the air and heat for drying. Long hay went onto the conveyor immediately after it was cut. In several hours it came out ready to grind. The driers cost upwards of $10,000.

Single rotating drum driers commonly used for drying fish meal and industrial products have been used to some extent for hay drying. The American Process Co., Lebanon, Pa. make two sizes of forage crop dehydrators of this type, 45′ and 66′ long.

The Arnold drier or Ardrier made by the Heil Co., Milwaukee, Wis., is a triple concentric drum drier 7′ in diameter and 16′ long. It dehydrates chopped hay direct from the mower in a matter of minutes at temperatures of 1000°–1500° F. Many of these dehydrators are in use for making alfalfa meal. A portable unit costing about $7,500 is designed to remove 2,500 pounds of water per hour. It weighs 12,000 pounds, is mounted on a truck and may be pulled by a tractor. It is not electrically operated.

Mow hay finishers were never

intended to handle wet or freshly cut hay as a dehydrator does. They were part of a new hay making process. The first part was to get the easy half of the water out of the hay by one day's curing in the sun. The partly cured hay would then be brought to the mow with all its leaves, color and nutrients, and the curing process finished in the mow. The mow can be an ordinary haymow or a special crop curing building. The mow finisher had to meet one requirement: It had to be low enough in cost so the hay crops of the nation on ordinary farms could be saved and upgraded.

The drying of baled hay, chopped hay and grain have been offshoots of the mow finisher. Quite a number of farmers have been taking chances on high moisture hay.

Experimental work and observations on farms have shown that hay that takes too long in the finishing process gets moldy and deteriorates in quality. Several things have been done to speed the finishing process. More air is being used. Ducts have been designed to offer less resistance to air flow and to the air entering the hay. There is a gradual trend toward using crop driers to add heat to the air.

J. B. Stere has devoted much time to the study of mow finishing. Here are the recommendations which he thinks most important in designing mow finishers today.

Provide a minimum of 1 sq ft of free opening between slats or through screens into the hay from air ducts for each 50 cu ft per min of air delivered by the fan.

Keep air speed through ducts under 1000 ft per min.

Fan should supply at least 25 cfm per sq ft of mow floor @ ¾" static. If ducts and openings into hay are large, the static pressure may not get above ½"; with a poor duct system it may be more than ¾".

Use vertical flue formers if the depth of hay is more than 12'.

It is, of course, essential that there be a free intake of air for the fan, and that the air and moisture that comes out of the crop have a free "get away" into the open where it will not be drawn back into the fan.

In drying hay, grain or corn, the secret of properly handling air is to get it to go through the crop to be dried and not be lost out the sides or up along walls. The location of ducts and placing of crops is important. Remember, air travels the path of least resistance. Kraft paper placed so the air will hold it against the walls will help seal places where you do not want the air to escape.

Mr. Stere reports that for Eastern Ohio and Western Pennsylvania, finishers for long hay rank first; baled hay, second; and, chopped hay, third.

Mr. Morris Lloyd of Buffalo Niagara Elec. Corp., Buffalo, N. Y. reports 59 hay curing systems on 45 farms. There are

No.	*Size*
6	7½ hp
37	5 "
14	3 "
1	2 "
1	1½ "

"Propeller type fans have been used almost exclusively. There is very little interest in applying heat, and apparently it is not necessary in this area. Of the 45 farms, 26 put up long hay, 13 chopped hay and 6 baled hay. Most of the installations are of the slatted floor type, with the open type center duct covered with welded wire also becoming popular. Several farmers have told us that when they ran out of barn cured hay and changed to field cured hay, milk production dropped one can in six."

Some interesting preliminary figures come from Dr. R. M. Carter of the Univ. of Vermont and Ralph J. Bugbee of Central Vermont Public Service. They cover studies on 33 farms using hay finishers for two or more years. There were 15 36″-propeller fans, 15 42″-fans and 3 centrifugal blowers. Motors used were 2 3-hp, 13 5-hp, and 18 7½-hp. Seventeen had the main duct in the center of the barn, 16 on the side. Slatted floor distribution was used in 22 barns, lateral ducts in 5 and open central main ducts in 6 long, narrow mows.

At North Carolina State College an all-purpose metal crop-drying building has been constructed and is under study. The work is being done in co-operation with the Blaw-Knox Co. The building is so laid out that it may be used for finishing hay, drying grain, drying peanuts, curing tobacco or drying corn. A 5-hp fan and 7 gallon per hour oil burning crop drier supplies heated air. J. W. Weaver is in charge of the project.

Anyone contemplating the installation of a crop drier should take advantage of the experience of farmers he knows and advice from the Agricultural Engineering Department of his state college. If you know a dealer or rural service man who is familiar with latest developments, he may save you mistakes. Some literature sent to us by manufacturers is several years out of date, so be sure before you start building or buying. Some manufacturers claim the mark-up is too small on fans and motors to cover the advice and service necessary on hay finisher installations. This is true, especially in new areas. It just puts more responsibility on the farmer, utility man and extension specialist.

Two new pieces of equipment may be useful in connection with

crop drying. A new Moisture Tester is offered by the American Crop Drying Co., Crystal Lake, Ill. It uses an infrared lamp and fan for drying the sample and reads percentage of moisture direct. A V pulley containing an automatic, mercury-operated centrifugal clutch reduces the big current demand on motors in starting. It might make the use of a larger motor possible. They are made by Automatic Steel Products, Inc., Canton 6, Ohio.

As the prices of farm products drop, it is going to be more essential to make investments that pay returns. If you put in a crop drier, be sure you do it right. Use the equipment for as many different crops as you can. It will reduce your investment per crop. It is the farmer who produces high quality products *efficiently* who will get along best when the easy margin is off the market.

Newborn Lambs Need Vitamin C

Extra vitamin C at birth may give lambs a better chance of living. That's what one season's trials at the University of Wisconsin indicate.

Of 1000 lambs receiving a vitamin C capsule at birth, 38 died. Of 1000 not getting any extra vitamin C, 56 died.

Records show that most lambs die during the first week of their lives and also that vitamin C levels are low, both in the lamb's blood and in the ewe's first milk.

At two days of age lambs that had received extra vitamin C had about twice as much in their blood as the others did. At four weeks the vitamin C levels were about the same in the two groups.

Flock owners cooperating with the university in these trials reported that the lambs getting extra vitamin C seemed more thrifty and healthier.

The scientists say that so far they have not run enough tests to show that vitamin C is responsible for better liveability and health. But so far the evidence looks good.

Farm Science Report
University of Wisconsin

Prove Bull's Value As A Calf

Condensed from Capper's Farmer

George A. Montgomery

THE BEEF PRODUCER can now employ a scientific formula to pick sires that will make him the biggest profit. With it he can force a bull, before service age is reached, to tell whether his calves will be good money-makers, or whether they will be average or poor. The new methods, and another for selecting heifers, should prove as important to beef men as the Babcock test has been to dairymen.

Beef bulls in the past have been picked largely by eye. It has been assumed that those showing the best conformation would sire the most profitable calves. But research has proved that a sire's hidden traits are more important than those that are visible. Even the smartest cattleman can't look at a younger bull and tell how fast his calves will grow, or whether they will be wasteful or efficient in utilizing feed. Yet these factors have a greater bearing on profits than slaughter grade or carcass quality, the traits most readily judged by eye.

The progeny testing project of the Range Livestock Experiment Station at Miles City, Montana, in which this information was developed, hasn't been concluded. But here, in brief, are steps necessary to prove a bull's value by the time he is 15 months old: (1) All calves are marked permanently by brand, and their birth weights are recorded; (2) a second weighing is made when calves are weaned at 6 months old; (3) bull calves go to dry lot immediately after weaning for a 196-day feeding period, during which they get about 10 pounds of grain a head daily, plus all the bright legume hay they want; (4) those that make the fastest, most economical gains from birth to close of the feeding period are chosen as the ones that will prove the best sires.

Truth of that last statement has been established by feeding out, over a period of years, the steer end of each bull's first calf crop, and comparing their gains and economy in use of feed with similar data for their sires. Year after year, with surprising regularity, the bull that made the best record in his test, produces the most profitable calves. Thus perform-

Reprinted by permission from Capper's Farmer,
Topeka, Kansas, August 1949

ance of steers can be predicted before they are born.

The formula is a long step forward. It hasn't been possible to judge a bull's value until some of his offspring could be fed out. By then, he would have been in the herd long enough to have sired 2 calf crops. That is too long, if he should prove to be no good.

Bulls are not injured by a feed of 10 pounds of grain daily for 6½ months. Any that could not handle that much probably would sire calves that would be unprofitable to their owners. The heavy grain feed has 2 advantages: It proves an animal's capacity, and it grows out a bull so he can be used on mature cows from the time he is 15 months old.

Bradford Knapp, Jr., in charge of the project, took me to see steers fed out in 1948–49. As in other years, each bull's progeny was penned together to be fed for a 252-day period. At that time, all had been on feed 188 days.

The 2 sire groups that were outstanding showed a lot of advantages over the others. They had plenty of quality, they carried more finish and size, and most calves had slick, glossy coats. The fastest growing lot, at the end of 184 days of feeding, had made average gains of 427 pounds of steer, 2.32 pounds a head daily. Their sire, Cougar Domino, had made feed-lot gains of 2.61 pounds a day, to lead all bulls of his year. Second in gains were the steers sired by Cobleigh Domino, runner-up to Cougar Domiño in feed-lot performance. His steers had put on 408 pounds apiece, an average of 2.16 pounds daily.

The slowest lot gained only 339 pounds a calf. They still had rough coats, their bellies were slim, they lacked finish, and they hadn't tamed like other lots. Since going on feed they had lagged 88 pounds and 69 pounds a steer, respectively, behind those of the 2 best lots. They had made slower growth during the nursing period, too.

It seems safe to guess that these little fellows carried about the same weight and finish after 252 days on feed that the thrifty steers showed after being in the lot but 170 to 180 days.

The top lots held the kind of steers experienced feeders call "good doers." The others were typically "poor doers." The groups spotlighted this fact: "Good doers" and "poor doers" are what they are because of qualities they inherited from their ancestors!

This article is being published before a financial statement is available to show the difference in returns. Here are some figures from other years: In 1947–48, steers sired by Carson Domino, outgained all others. They cleared $42.57 more apiece, above all costs, than those from the poorest sire. In the feeding year 1946–47,

calves from the best bulls cleared $39.31 apiece more than those sired by the poorest. They outgained the "poor doers" ¼ pound a day and they made 100 pounds of gain on 10 per cent less grain and a little less hay.

The bulls Carson Domino, Cobleigh Domino and Cougar Domino are sons of a grand old sire, L1B Domino 2nd. He could have passed unnoticed but for the progeny testing program. He probably never would have been selected as a sire by a breeder who looks for showtype bulls. His steers finished nearly 100 pounds heavier than those of the next best sire, they required less feed for each 100 pounds of gain, and they returned 23 per cent more above production and marketing costs. They gained 2.28 pounds apiece daily in the feed lot, while the next best mark was 1.89 pounds.

That was in 1943–44. Knapp then considered 2 pounds daily a good gain, 2.28 pounds outstanding. Examination of the records showed L1B Domino 2nd had made faster feed-lot gains than any other bull fed out to that time, 2.4 pounds a day. His steers outstripped any fed previously. He was added to the breeding herd and in each of 4 recent years one of his sons has proved the fastest gaining bull, then has sired a crop of steers that outgained those of all other sires when they went on feed.

One year Adam Domino, distant relative of old L1B 2nd, popped into top spot as a feeder and a sire of feeders. He was the station's second big find. He gained faster than had L1B 2nd, and his steers were superior. He was the best gaining bull tried to that date, but his record was topped next year by Carson Domino, his half brother from the same dam. That spotted the cow, L1A Lady, as a superior individual.

Now the station is developing a super line of Herefords, all of which will trace back to L1B Domino 2nd, Adam Domino and L1A Lady. It now includes 150 cows of breeding age. All are the fast growing profitable kind of cattle. The steers finish to grade top good to choice at a young age. Each year some bull of the line beats all previous records made at the station. The leader last year gained 2.32 pounds a day from birth to weaning, and 2.62 pounds daily for the 196 days on feed.

The Miles City work indicates that the larger strains of Herefords make the fastest growth (1) during the nursing period, (2) on grass as yearlings or 2-year-olds, or (3) in the feed lot. It seems reasonable that they should: The bull that weighs 2,100 at 4 years old must put on 100 pounds more annually than a 1,700-pounder.

Knapp believes the next big step in cattle breeding should be

development of "good doing" lines that are not closely related. He says that is a job for the purebred producer. The commercial cattleman then could cross bulls of one strain on cows of another. If bloodlines were unrelated, Knapp feels crossing them might give some of the hybrid kick that comes from crossing 2 breeds.

One Montana rancher became interested in the project and bought the best bulls after the station had picked those it needed. He says they have added 100 pounds to the weight of yearlings he sells. Other ranchers also got the same idea. Now cattlemen of the state are putting in their orders for bulls before they are born at prices that range from $400 to $600. Knapp says the station could get advance orders for 100 or more annually if there was any chance they could be delivered.

A similar test has been carried on at the North Montana Branch Station near Havre in co-operation with the Range Livestock Experiment Station and the Montana station at Bozeman. The best sire's calves weaned at 450 pounds, those of the poorest at 400. When sold the best bull's calves were 145 pounds heavier. They netted $36.69 more a head, and showed higher carcass grade.

Work in testing cows and heifers at Miles City is not as far advanced as the bull-testing project. More progress can be made with a bull that gets 25 to 30 offspring annually than with a cow that produces one. Steer tests show that a calf profits almost as much from the desirable qualities of his dam's sire as he does from those of his own sire.

It isn't practical to feed out breeding heifers in the same manner as bulls. The station, which breeds heifers to calve at 3 years, has found those largest for age at about 18 months make the most profitable cows. That gives them a full year on their own after they are independent of the influence of the dam.

Aureomycin for Mastitis

Condensed from The Michigan Farmer

Fred Trump

AUREOMYCIN, the earth-mold drug, attracted wide attention in human medicine in 1949 as the "miracle drug." It is now being acclaimed as a cure for mastitis—in dairy cattle.

Experiments by University of New Hampshire scientists have shown that aureomycin acts very rapidly and effectively. It is said to kill a wider variety of mastitis bacteria than penicillin or other drugs. It penetrates to all parts of the udder, and may persist for more than 4 milkings. It is easy to use and has lasting strength. Aureomycin, like penicillin, is non-irritating and non-poisonous. In many cases aureomycin has brought about a complete cure in from one to 2 weeks.

But this new drug, like penicillin and other drugs before it, will probably prove disappointing to farmers who use it improperly, warn Dean C. S. Bryan and Dr. A. R. Drury of the veterinary school at Michigan State College.

They maintain that good herd management and sanitary milking procedures are important in the control of mastitis and only when these are carried on can treatment with drugs be effective. Proper management alone often eliminates mastitis.

They point out other reasons why aureomycin may appear to be ineffective in treating mastitis. If the udder has been injured or bruised, inflammation will result without bacterial infection. Aureomycin or penicillin have no value in such cases.

In fact improper use of drugs may introduce infection into an inflamed but non-infected quarter. Bacteria on the end of the teat may be pushed far up into the teat canal where no drug can reach. The hands and the teats must be sterile if treatment is to be effective.

Where bacteria infection is present in the udder, aureomycin and penicillin can be effective, if used soon enough and if accompanied by proper milking and management methods.

More than 25 per cent of the dairy cattle in the country have mastitis. But only about 10 per cent of infected cows have acute cases that can be recognized by

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swollen quarters, bad milk, or illness. Most mastitis is chronic and can be detected only by microscopic examination of the milk.

When mastitis develops from the chronic into the acute stage—when it becomes visible—it is so far advanced that treatment with aureomycin and other drugs often has little chance of succeeding. Aureomycin supplements penicillin and is not expected to replace it. Scientists have found that aureomycin works best on the Staphylococci bacteria, while penicillin still shows better results against the Streptococci bacteria. Streptomycin is best for the Coliform bacteria.

Experiments in Michigan have shown that aureomycin has completely cured 16 out of 29 cases of infectious mastitis. In 6 cases the infection was reduced but not eliminated. Dr. Drury says that temporary relief is of little value, because repeated treatment is quite costly.

The best results were against the Staphylococci type. Two acute cases and 6 chronic cases were cured. But in one acute case the infection was only reduced, while in another acute case the drug had no effect.

Against the Streptococci bacteria cases the drug cured 4 and reduced the infection in 2, one of them acute. Aureomycin was not able to cure 3 cases of chronic mastitis and one case of the acute form.

One case of Coliform mastitis was cured with 2 doses each of 200 milligrams of aureomycin.

Of 8 cases of the Corynebacteria form of mastitis treated, 3 were cured, 3 were somewhat controlled, while 2 cases were not helped at all. Two acute cases were cured.

But why go to all this trouble with cows having chronic mastitis as long as the milk is still salable? This is a question Dean Bryan expects farmers will ask. He said that Pennsylvania State Agricultural College authorities have shown that cows with undetected chronic mastitis gave 22 per cent less butterfat. At MSC it was found that such milk was 50 per cent lower in quality. Mastitis forms scar tissue. This reduces the milk producing capacity of the udder and changes the chemical composition of the milk so that it may lose some of its nutritive value, says Dean Bryan.

Sanitation Is Vital

1. Milk healthy cows first, infected ones last.

2. Discard the foremilk into a strip cup and exclude all abnormal milk from the supply.

3. Wipe udder with warm disinfectant solution one minute before milking.

4. Dip teat cups and hands in disinfectant between cows.

5. Exclude infected persons from milking cows.

6. Milk regularly, rapidly and completely.

Sanitary herd management methods are also necessary, say the MSC veterinarians. These methods are:

1. Have proper stalls.

2. Be prompt in treating udder injuries.

3. Clean and disinfect stalls after removing infected cows.

4. Keep barn and barnyard clean and dry.

5. Remove accessory teats early.

6. Raise heifers as disease free replacements.

7. Purchase bred heifers as second choice and milking cows that have been tested and isolated before purchase as third choice in securing replacements.

8. Isolate or slaughter infected cows that have badly damaged quarters.

Little if anything is to be gained by the use of aureomycin or penicillin if these other practices are not followed.

Sowing Seeds Of Knowledge

Condensed from *News* from CARE

In Southern Europe, a farmer took a CARE representative through his grape orchards.

"I wanted you, especially, to see this," he said, "because my grapes came from America—from your country."

But weren't there plenty of cuttings available in his own country?

"Oh, yes," he agreed. "But the company in the United States promised that with every order they would send a book of instructions. I wanted to know what methods your farmers in America were using. And now, look. Just look!" He waved his arms proudly over the flourishing vines. "I've never seen such grapes before!"

That incident illustrates the great desire for knowledge of new farming techniques among farmers overseas today. It is part of the hunger for information among scientists, engineers, chemists, doctors, technicians in every field. It is part of the background that led CARE to augment its food and textile package service with a new Book Program, whereby the latest technical and scientific volumes—among them books on agricultural and veterinarian science—are being provided for the people of

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war-wrecked and under-developed countries in Europe and Asia.

Through that program, launched in cooperation with UNESCO (United Nations Educational, Scientific and Cultural Organization), sizable book shipments have already been delivered to many countries abroad, as gifts from Americans. The Universities of Athens and Salonica, Greece, have received $500 worth each of new text and reference books delivered by CARE—many of them volumes of agricultural science. Deliveries of $1,000 worth of books each have gone to the Library of the University of Louvain, Belgium; the allied-sponsored Free University of Berlin; the University of Vienna, Austria, and the National Diet Library of Tokyo, Japan—with books on agriculture stressed for both the Austrian and Japanese institutions, at their specific request.

But the progress to date can be no more than an encouraging beginning for the tremendous task CARE laid before the American public when it announced its Book Program last spring.

The war exacted a tremendous price from the world's book supplies. First there were the book-burnings, the deliberate destruction and book confiscations carried on by the invading armies in order to gain mastery over the thoughts and skills of their victims. Then the bombs that burst everywhere —our own bombs as well as the enemies'—inevitably caught libraries and schools in their fire.

The Institute of Agriculture and Forestry, at the Technical University, Prague, Czechoslovakia, lost 18,000 of its prewar 20,000 books. . . . The British Museum Library, London, lost 250,000 books . . . 70,000 books were lost when the Public Library in Corfu, Greece, went up in flames. . . . The University of the Philippines lost 143,959 volumes when its library was destroyed during the fighting for the liberation of Manila. Only 3,000 volumes were saved—and these only because they were in the hands of borrowers . . . .

Even more important, from the viewpoint of reconstruction, no new books came into the countries abroad during the years of war—no knowledge of technical and scientific advances. When CARE offered two seed packages last spring, for instance, it was only to Italy that hybrid corn seed could be sent. For it was only there, where UNRRA had introduced hybrid corn shortly after the war, that farmers knew how to plant and use the seed. Elsewhere in Europe, hybrid corn was a mystery.

Aggravating the problem of reconstruction still further was the fact that the bombs also took their toll of printing presses. Since the war, there has been virtually no

technical publishing overseas. Just as doctors, engineers, teachers now need information on developments in their field, so farmers need information on soil conservation and animal husbandry, on crop rotation and contour plowing. Veterinarians need the latest facts on livestock production and inspection. Yet, dollar shortages and the many demands of reconstruction combine to make it impossible for the countries abroad to buy the books that contain that information—the books which are so easily available here.

Those are the reasons that led CARE to add its Book Program, which has been approved by the U. S. State Department's Committee on Voluntary Aid. The plan works this way:

CARE and UNESCO representatives abroad have obtained lists of their book needs, in specified categories, from schools, universities, libraries, and other educational institutions abroad. With the funds made available by the public here, CARE then fills those needs as closely as possible by buying and delivering the latest and best books published in English in those fields.

To make certain that the books provided are actually needed, CARE accepts no used books for this plan. Its purchases, from the money donated by individuals or organizations, are based on book lists compiled by a professional committee headed by Dr. Luther Evans, Librarian of Congress. Through special publishers' discounts, all CARE's costs of purchase, transportation and delivery overseas are covered at the publisher's list prices. Delivery of books in English fills an express demand: 85 per cent of the book requests UNESCO has received from foreign countries have been for books in this language.

Categories covered were recommended by reconstruction authorities as priority needs. In the field of agricultural science, subjects include: general agriculture, agricultural engineering, animal husbandry, apiculture, botany, crops, dairy products, entomology, farm management, food technology, plant breeding, plant pathology, pomology, poultry, soils, statistics, vegetable crops, forestry. Subjects covered under veterinary science include a broad range of volumes on veterinary medicine and food production and inspection.

(The other categories covered are medicine, health and welfare, dentistry, nursing, English language instruction, biology, pharmacy, chemistry, engineering, geology, mathematics, physics, physiology, psychology, sociology, teacher training, library administration and statistics).

To reach the greatest number of people, the CARE book deliveries are made to institutions only, not individuals. Countries

now served are Austria, Belgium, Czechoslovakia, Finland, France, Italy, Greece, Great Britain, Western Germany and Berlin, Korea, Japan, the Netherlands, Norway, Pakistan and the Philippines. Agreements with other Far East countries are pending. By contact with each government, the books are admitted tax and duty free.

Every effort is made to continue CARE's usual person-to-person contact. Cash donations in any amount can be sent to the CARE Book Program, 20 Broad St., New York 5, N. Y. (or any local CARE address). Contributions under $10 are pooled in a general fund. But donors of $10 or more can specify the book category, country, specific institution or type of institution. (In order to best fill the needs, CARE hopes the majority of donors will leave it up to the agency's discretion to choose recipients). On each $10-or-more donation, delivery is made in the donor's name, and CARE returns a receipt signed by the recipient, so that you know exactly where your book gift has gone. On request, the donor will also be named on the special CARE-UNESCO book plate in each volume.

Each book delivered by CARE thus becomes an investment in friendship, carrying within its covers constant proof that Americans are willing to share their knowledge. A book on agriculture seems like a simple thing. But Greece, ravaged by world and civil war, must reclaim its burned-out earth . . . Japan, in an area no larger than California, must support and feed 80 million people . . . More food produced in Great Britain could help ease the tight austerity rations . . . The Philippines, with vast unused tracts of fertile land, still finds it necessary to import rice . . .

In the countries overseas, the books you place in their farmers' hands can increase food supplies, help fill the empty stomachs that breed unrest. Paul Comly French, CARE's Executive Director, sums it up this way: "With books, let us help sow the seeds for a world in which people can be nourished on understanding and peace."

Practical Milking Programs

Condensed from The Maryland Farmer

J. E. Kittinger and Logan T. Wilson, Ph.D.

FEW dairymen realize that they are a part of one of the world's biggest industries nor do they realize that each one has the means at hand to increase his profits 25% over a period of years without extra spending and with less labor cost.

The dairy industry in America offers employment to about 12 million people in the production, manufacture and distribution of its products. This means that about one out of every dozen of the people of America depends on dairying for a livelihood. The dairy industry has been paying annually the enormous sum of above $4,000,000,000.00 to those of the industry. The potential demand for milk and by-products of dairying exceeds the supply in spite of the fact that some sections are producing ten times the amount they were 25 years ago. Dairying offers steady, all year employment, a cash crop that is dependable, and opportunities for young men that have seldom been equalled anywhere .

However, it is almost unbelievable that an industry so large and one that has advanced so far in 25 years could suffer such large losses and survive. Millions of dollars are wasted by dairymen each year by old fashioned milking practices, poor breeding practices, boarders, poor housing and management, and diseases such as mastitis, Bangs disease, tuberculosis, and many other leaks that are largely preventable.

A recent report shows that four of the most progressive states with a dairy population of 5,884,000 cows produce nearly 14 billion pounds more milk than do an even dozen of their sister states, which have a dairy population of 5,871,000 cows or about the same number. This indicates that the twelve states could increase their income by more than $500,000,000 by adopting the progressive practices of their four sister states.

Correct milking will increase the amount of milk the farmer sells, help to prevent mastitis, and keep the cows in the herd giving milk profitably for double the average number of lactations. Labor and time consumed by milking will be greatly reduced

Reprinted by permission from The Maryland Farmer,
Baltimore, Maryland, January 1950

and enormous savings can be made in veterinary expense.

With the foregoing in mind the following recommendations are offered as a part of the Sherwood Field Service Program to those who desire to adopt the practices that are helping dairymen of America to make more money.

It is of the utmost importance that simple precautions be observed in preparation of the cow for milking. Nearly 7% of all the milk received at some dairies is rejected because of high bacteria count. Information advanced by Professors Rucker and Henderson of the Illinois Station gives some startling reports of the penalties which careless dairymen must pay.

Keeping the udders and flanks clipped is the first step. Before each milking the udder should be washed with a sanitizing solution. It was found in one test that dirty cows produced milk with 70,000 bacteria per c.c. Washing the cows reduced the bacteria count to 6,200 per c.c., and clipping and washing brought it down to only 550 per c.c.

Washing and clipping is not the entire solution, however. While the bacteria count was only 550 per c.c. for the cows washed and clipped, there was also no mastitis present. It is absolutely impossible to produce clean milk from cows infected with mastitis. It was shown that although cows were clipped and washed before milking, the milk showed a bacteria count of 140,000 per c.c. when mastitis was present in the herd at 75%. This indicates that mastitis, when present, will cancel any benefit derived from other good practices.

Cows should be milked at the same time each day and if possible by the same person. They should not be disturbed by a vicious dog or other excitement in driving them in. Never rush the heavy milkers and do not permit them to be abused by inexperienced help. Gentleness in handling will pay off with more milk, since it has been proven by thousands of dairymen that a cow must like to be milked in order that one may get all the milk she is able to produce. Strange or loud voices often disturb the cow at milking.

Nature intended the warm moist mouth of the calf to be the sign for the cow to let down her milk. The calf will butt the udder and give a few preliminary sucks during the one minute required for the pituitary hormone to cause the milk to start flowing. When we wash the udder with warm water and massage it we are simply stimulating the nerves in the cow's udder that nature placed there for the purpose of signaling bossy to "Set the table."

All the milk you will get at any milking is present in the udder at milking time. One minute before the machine is attached the udder

should be washed and massaged with a warm cloth dipped in water that contains a sanitizing solution. A loss of 15% of the milk may result from washing the udder 20 minutes before applying the machine. As soon as the udder is massaged, foremilk three squirts from each teat into a strip cup or strip pan. Experiments have shown that foremilk contains a high bacteria count and about 80% of the bacteria in the teat will be present in the first three squirts. Foremilking also will give one of the first indications of mastitis by flakes or clots showing in the milk. This foremilking also opens the ends of the teats and speeds the milking when the machine is applied.

If you milk by machine, never increase the vacuum or change the speed of the pulsations of the machine from the makers' recommendations. To do so may injure the delicate lining of the teat and cause mastitis or infection and scar tissue to develop which will block the teat and may cause the loss of quarters.

If you have properly prepared the cow by warm water washing, massage and foremilking, most cows can be milked out completely in three minutes. They can be trained to respond to fast milking in about 5 days. Occasionally a cow will not respond, and if you own such a cow, place her at the end of the line and milk her last. Such cows will usually respond to rapid milking the next lactation. Some cows will respond to the sound of the starting of the milking machine and will let down their milk. They should be milked first and it is sometimes necessary to adjust their milking practices, since the action of the hormone that causes them to let down their milk will usually last about seven minutes.

Stripping with the machine is quicker than by hand, will reduce the number of bacteria in the milk, and will help control infection of the udder. In machine stripping, pull down on the teat cups with one hand while stroking the quarters downward with a squeezing motion. As soon as the udder is empty, remove the teat cups. Learn to tell when the udder is empty by its feel.

A rapid milking program makes it easire to utilize the advantage of three times a day milking. Milking three times will produce about 20% more milk than the same cows will yield on two time milking. With high producers there is less strain on the udder when the cow is milked three times and thus less danger of injury and mastitis.

In a herd large enough to keep two men busy, three time milking can be done with very little additional labor when milking with

machines is practiced. A convenient arrangement is to have one man do the early morning milking, both work on the midday milking, and one man do the late evening milking.

The exact routine for rapid milking, one man operating two machines, is given below:

First: Wash the udder of cow No. 1 with warm water containing a sanitizing solution and massage the udder to stimulate the warmth and touch nerves. Foremilk three squirts into the strip cup and check for flakes, clots and bloody or stringy milk.

Second: Repeat the above with the second cow exactly as with the first one.

Third: Attach the machine to cow No. 1.

Fourth: Prepare cow No. 3.

Fifth: Attach machine No. 2, to cow No. 2.

Sixth: Strip out cow No. 1 with machine, weigh or empty milk from first cow, rinse teat cups in cold water, dip in sanitizing solution, attach milking machine to cow No. 3.

Seventh: Dip teats of cow No. 1 in teat cup containing sanitizing solution, prepare cow No. 4 by washing and massage, etc.

The above routine when properly established will increase production, reduce mastitis and bacteria, and save time and labor. It will keep the cows at a higher level of production for a longer milking season, and will keep them in the herd profitably for more lactations.

Causes Of Multiple Births In Cattle

Condensed from The Shorthorn World

Carl W. Gray

THE shepherd reckons that good flock management should assure him at least a 150 percent lamb crop and he is disappointed if he doesn't make it, while the hog man measures his success by the number of pigs weaned per sow. But the cattle man is in most instances little interested in multiple births and the advent of twins in his herd is not usually the subject of good news. To the casual observer this seems strange since the profit returned by the herd of cattle, like the flock of sheep and the herd of hogs, is largely influenced by the increase, and twin heifers will build up a breeding herd more rapidly than one heifer at a time.

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What the casual observer does not know is that twin births in cattle always constitute a threat of a barren female and while twin heifers might be welcomed the odds are against such a desirable outcome of a dual pregnancy in the cow. In fact the experienced breeder does not look with favor upon the prospect of twin calves, and he is better satisfied with normal single births than to hazard a double on the chance that he might obtain thereby two breeding females instead of one.

There is a serious sex complication involved in twin births in cattle which might be less bothersome if it were more completely understood. There is not much that the breeder can do to save himself the loss that results from the birth of freemartins except to avoid families in which twinning is of common occurrence, and to determine as soon as possible whether the heifer calf concerned is destined to prove sterile or is potentially a valuable breeding female.

Freemartins have been reported in early cattle experience but their cause has been a matter of dispute until comparatively recent date. It is essential to become well informed on the general suject of twinning before one attempts to explain what goes on in the formation of the freemartin. Suppose that a certain designated cow in the herd is alleged to have given birth to twin calves. There are five possibilities to account for what has taken place.

First, true twins. The cow may truly have had twins in the strictest sense of the word, i.e., two calves resulting from the fertilization by one sperm cell of an egg cell which later undergoes cleavage and develops two embryos and ultimate fetuses. Such calves would have received identical inheritance, developed identical body characteristics and become individuals identical in all respects. They are true twins but their incidence is rare. Obviously if the calves reported are of opposite sexes the possibility of their being true or identical twins is out, although the reverse is not necessarily so viz., calves of the same sex are not always true twins.

Second, fraternal twins. The two calves may be no more alike in physical make up nor by inheritance than any two calves born of the same parents in separate years. Two egg cells have been fertilized independently and the only difference between these calves and other brothers and sisters is that conception, gestation and birth have taken place concurrently, hence their designation as twins. Biologically these are dizygotic twins (two fertilized eggs) and their occurrence is most common of all. Twin heifers and twin bulls suffer no interference with their sexual development as

a consequence of their paired prenatal life.

Third, superfetation. The two calves born together may be the product of superfetation (the formation of one fetus upon another). What has actually taken place is that the cow has been in heat, bred and conceived. However, there has been a slip up in the functioning of the hormones (chemical messengers) which ordinarily would prevent the female coming in heat while pregnant and that is just what she does. Supposing this means that she failed to settle to the first service she is bred again and conceives, literally forming one fetus upon another. The second manifestation of heat may be at the following 18 to 21 day period or one or even two subsequent periods may be skipped before the second heat is displayed. The longer the time elapsed between conceptions the greater the difference in development of the two calves at birth, the first suggestion of superfetation. This is often accepted erroneously as evidence that one fetus has grown at the expense of the other. The birth of both fetuses takes place at the completion of the gestation period of the first one conceived, hence if the other one gets started some forty odd days later it will not be ready to be born when delivery of the first one is due but goes along just the same because once the uterus begins to contract all of its contents are expelled with no chance for a tardy fetus to be held back until its development is complete. The disparity in development of the two calves indicating that it is a case of superfetation may be confirmed by inspection of the dates of breeding. The second breeding may have been to a different sire.

Fourth, superfecundation. The two calves which have just concluded a common prenatal existence may give unmistakable evidence of having different sires even though their dam was bred in but one and the same heat period but to two different bulls. Iowa State College reports twins out of a Holstein cow, one black, the other spotted. Service records revealed that the cow had been bred both to an Angus and an Ayrshire bull on the same day resulting in the fertilization of two egg cells, one by each bull.

Fifth, freemartin. These of necessity are dizygotic or fraternal twins but quite distinct from the general run of such twins. A freemartin long has been defined as a heifer twinned with a bull and that is true but not the whole truth. More accurately a freemartin is an imperfect heifer whose genital development has been interrupted and otherwise influenced by hormones derived from the bull to which she is a twin. Dr. Frank R. Lillie of the University of Chicago is the accepted authority

on freemartins and he finds about 13 percent of heifers twinned with bulls to be normal in reproductive organs and therefore not freemartins.

There have been various theories to account for what causes freemartinism, notably that of the late Dr. W. L. Williams (*Diseases of the Genital Organs of Domestic Animals*) who takes issue with the hormone theory and expresses the belief, based on an extended clinical experience, that the freemartin results from a defective egg cell which lacks the embryonic structure from which the genital system develops. He cites many cases to support his contention but the Lillie explanation of the cause of the freemartin is the one generally accepted. Dr. Lillie arrived at his conclusions after an exhaustive study of material obtained from the killing floors of Chicago packing plants. Post mortem examination of the generative organs of pregnant cows carrying twin calves led to the following conclusions. A—the outermost of the three fetal membranes which envelop each calf during prenatal development undergo fusion from their contact in the uterus. B—since these are the membranes (chorionic) which support the blood vessels their fusion makes possible an anastomosis or crossing over and joining up of some of these blood vessels. This intercommunication of capillaries permits the circulation of blood from one fetus to the other. C—the male fetus develops in advance of the female hence his body is elaborating sex hormones first and these introduced into the heifer fetus in the blood stream have a profound influence upon her sexual development. Hormones are defined as chemical substances originating in certain tissues or organs from which they enter the blood stream to be conveyed to other tissues or organs whose functions they either stimulate or inhibit. In this case the hormones derived from the male sex organs inhibit the development of the female sex organs so that the freemartin is essentially of neuter gender, an incomplete, imperfect female incapable of reproduction.

In the fat stock show the freemartin is classed with the castrates, the classification reading steer, spayed or martin heifer. Freemartins sometimes are confused with hermaphrodites which are dual sexed, the true hermaphrodite having some of the essential structures of both sexes, vulgarly but quite aptly referred to as "he-she." If the body structures as well as the sex organs partake of the nature of both sexes, as one half male and the other half female, the individual is a sex mosaic or gynandromorph. The freemartin is neither hermaphroditic nor gynandromorphic but an imperfectly formed female although the action

of the male hormones may tend to throw the irregular sexual development of the heifer calf to the male side in some instances.

Twinning is definitely hereditary so the best protection for the breeder is to avoid families in which the birth of twins is marked by any degree of regularity. The fertile 13 percent of heifers twinned with bulls that are not freemartins but perfectly normal females complicates the situation. If fusion of the chorion coats, and anastomosis of blood vessels and circulation of male hormones through the female fetus arresting the development of the female genitals and resulting in sterility took place in 100 percent of the heifers born twinned with bulls the feedlot would clearly be the only out, but when something like one out of every seven so born may become a perfectly normal breeding female, and possibly be so well bred as to justify great expectations the problem is serious. In some auctions breeders have gambled on the 7–1 odds to the extent of authorizing the auctioneer to accept alternate bids on any heifer offered as having been twinned with a bull, i.e., so much to be paid if and when she proves a breeder or a market figure per pound in case she does not breed but has to be sold over the scales.

It is unfortunate that there are no adequate external means by which the cattle man can determine whether a heifer calf twinned with a bull is a real freemartin or not and manual exploration in young calves is impracticable for him. Yet it is of great importance to the breeder, especially of purebred cattle, to make this determination just as early as possible. Recently Dr. M. A. Fincher, head of the Department of Veterinary Medicine in the New York State Veterinary College at Cornell, has announced a simple procedure which he has found quite dependable in new born calves. It is based on the fact that the inhibited sexual development most often affects the tubular genital organs, vagina and uterus, the latter being absent, the former present only in part. The test employs an ordinary test tube 6″ × 1½″ which is inserted through the vulva. If a freemartin with incomplete or imperfect vagina and therefore destined to be sterile the test tube can be inserted no more than half its length but if a normal female the vagina will admit the test tube for its full length. This simple device by Dr. Fincher has important possibilities as an aid to the breeder in deciding what disposition to make of his heifer calf twinned with a bull.

Prefabricated Cockerels

Condensed from The Nation's Agriculture

H. H. Alp

DR. J. HOLMES MARTIN, Head of the Poultry Department, Purdue University, recently stated that the newly organized Indiana poultry breeding cooperative should furnish "prefabricated" cockerels which can be distributed as baby chicks to member breeders and in turn be used as "pollen" on their respective supply flocks.

Forty to fifty Indiana hatcherymen and breeders have organized a poultry breeding cooperative with some 57 members and stockholders. They have purchased a 160 acre farm near Lafayette and will develop as quickly as possible a modern poultry breeding farm. The manager will be Mr. Glenn L. Searcy, whose chief objective will be to test and determine the value of various strains and crosses of poultry in which the members are most interested.

Establishment of this cooperative by Indiana breeders and hatcherymen is just another indication that the poultry industry is moving more and more into the specialized field. It also means that a concentrated effort will be made to provide the type of product demanded by both producer and consumer.

Because of the increase in the size of flocks and the trend toward more commercial production, chick purchasers are becoming more particular and more interested in chicks designed to serve a special purpose. It is not so many years since we thought in terms of a state average figure of around 80 to 100 eggs per hen. Today that figure can be doubled and it is not uncommon to hear of 200 or more eggs per hen per flock.

From a meat standpoint, ten years or so ago we used to think in terms of four or five pounds of feed required to produce a pound of chicken in about seven weeks time. Today we are producing a pound of chicken on around 3 pounds of feed, and we are getting a weight of 3 pounds or more anywhere from 10 to 12 weeks. This all means that poultry breeders have been specializing in breeding for greater efficiency whether it be for eggs or for meat.

The future trend will undoubtedly continue in the direction of still greater efficiency consistent with consumer demands, and Indiana poultrymen are going to pool their efforts and money to work on the job together.

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Use Of Roughage For Steers

Condensed from Farm Research

J. I. Miller
Cornell University

NEW YORK livestock production is built largely around pastures and other roughages. Bluegrass-white clover pastures, mixed timothy-legume hay, and corn silage are in the roughage crops most widely used in beef production. With such feeds available on farms, an important problem is how to use them most efficiently in producing beef. Experimental work with steers has been in progress at Cornell since 1944 to obtain information on feed requirements and outcome of cattle fed and managed in various ways.

In each of three trials (1944, 1945, 1946) good to choice yearling feeder steers purchased from Texas in the spring were turned on good improved permanent pastures, consisting mostly of Kentucky bluegrass and wild white clover, but with some Ladino clover. In each trial a lot of 9 or 10 steers was fed and managed according to each of the four following methods: (1) grazed on pasture alone and marketed off grass at an average date of October 10; (2) full-fed coarsely ground corn by hand once each day in addition to pasture, and marketed at average date of October 4 following 128 days of feeding; (3) pasture alone until an average date of August 12, then full-fed in barn for approximately 100 days, marketed November 20; and (4) pasture alone until end of pasture season (October 30) then full-fed in dry lot for 100 days, marketed February 5.

The steers fattened on pasture alone made an average daily gain of 1.32 lbs., averaged medium grade as slaughter cattle, and had a dressing percentage of 53 per cent. They had the lowest cost per cwt gain, the lowest selling price per cwt, and the lowest net return above steer cost and feed cost of the four feeding methods.

The steers fed corn on pasture consumed an average of 1170 pounds of corn per head during the feeding period, made an average daily gain of 2.15 pounds, graded high good to low choice when marketed, and dressed 59 per cent. They sold for $3.89 more per cwt than did the grass-fattened steers, and were decidedly more profitable, averaging $21.20 more

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profit per head. In fact, feeding corn on pasture proved to be the most profitable of the four methods.

The steers grazed on pasture alone until mid-August, then full-fed in dry lot for 100 days, made excellent use of pasture during the flush pasture season, consumed about the same amount of corn during the dry-lot period as did the steers fed corn on pasture, and graded good as slaughter cattle. They returned a profit each year—less than steers fed corn on pasture, but appreciably more than the steers fattened on pasture alone.

The group of steers that were grazed on pasture alone until the end of the pasture season (October 30), and then full-fed in dry lot for approximately 100 days, again consumed about the same amount of corn per head; they averaged 1188 pounds for the dry-lot period, and graded good as slaughter cattle. They returned somewhat more profit in two of the three trials than did the steers fed similarly but started on dry-lot feeding in August. These results indicate that removing steers from pasture in August for finishing in dry lot is the better plan for years when pastures become dry in July and August, as occurred in one of the three trials. However, in years of favorable pasture conditions, using the full pasture season results in additional economical pasture gains and fattening.

During the same years in which the feeding trials just summarized were in progress, another series of three trials was conducted with calves purchased in the fall. In these trials, good to choice Texas calves, weighing over 450 pounds at the start in late November, were fed and managed according to four methods as follows: (1) full-fed a good fattening ration in barn throughout feeding period of approximately 160 days; (2) fed 2 pounds of corn, 1 pound of protein supplement, and full-fed corn silage and mixed hay for 56 days, then full-fed corn in dry lot approximately 130 days; (3) wintered on a growing ration with 2 pounds of corn, mixed hay, corn silage, and protein supplement; grazed on pasture alone until mid-August, then full-fed in dry lot for 70 to 84 days; and (4) wintered on mixed hay, corn, silage, and protein supplement (no corn); then pastured until mid-August, followed by full feeding in barn for 70 to 90 days.

The calves full-fed in dry lot for 160 days graded good to choice when slaughtered, and dressed 60 per cent. The other group of steers fed entirely in dry lot, but fed a growing ration for first 56 days, ended the trial with approximately the same grade and dressing percentage when marketed about a month later. This latter method of feeding required about 90 pounds

less corn and 1185 pounds more corn silage per steer than did the all-full-feeding method. There was little difference in net returns between the two methods of feeding.

The calves that were wintered on 2 pounds of corn, hay, corn silage, and protein supplement made an average daily gain of 14.7 pounds during the wintering period, at a feed cost of $27.26 per head, as compared with a gain of 1.15 pounds and a feed cost of $22.89 for the calves that received no corn in the wintering ration. In the spring each group was appraised at the same price per cwt as feeders, and if they had been sold as feeders at this time, the lot receiving corn would have returned $3.80 more profit per head.

The steers that had been fed corn during the wintering period (307 pounds per head) averaged 46 pounds heavier at the start of pasturing but only 28 pounds heavier when each group was taken off pasture in August. At the end of the finishing phase in dry lot each group graded about high good and dressed 57 per cent, but with a slight advantage for the better-wintered group. The net returns were very nearly the same for each group. These two lots of calves, however, returned about $15.00 more per head above steer cost and feed cost than did the calves fattened entirely in dry lot.

An interesting and an important result from these trials was the money return per acre of pasture as used in each of the six methods of feeding and management studied. To arrive at an answer to this question, data were used from these trials, but prices for feeds and cattle were those for the 5-year period 1935–39; these were believed more reliable for this purpose. Also, any return above steer cost and feed costs other than pasture were credited as returns from pasture. The returns per acre came out as follows: (1) $35.00 for the calves wintered with limited amount of corn, grazed until August, then fed in dry lot; (2) $29.00 for the calves wintered with no corn, then handled in the same manner; (3) $21.00 for the yearlings purchased in the spring and fed corn on pasture; (4) $13.00 for similar yearlings grazed entire season on pasture alone, then fed in dry lot; (5) $9.00 for the yearlings grazed until mid-August, then fed in dry lot; and (6) $3.00 for the yearlings purchased in the spring and fattened on pasture alone.

Ranching and Good Farming

Condensed from The Hereford Journal

C. A. Brennen

MANY western people, including a good many town folks, feel that there is something disparaging about being a farmer.

This impression which many people, especially in the intermountain country, have of farming has caused numerous cattle ranchers to frown upon and give too little attention to the farming part of their operation. As a consequence, progress among too many cattle ranchers has lagged, because they have not given as much emphasis to the growing of crops on their ranches as they have to the breeding and handling of the cattle.

The importance of farming to a cattle operation is brought to the front when one realizes that in most of the country the cattleman has to grow crops to provide forage for his cattle during the greater part of the year. Of late years the western cattleman has had to grow more feed on the ranch than heretofore to offset the dimishing supply allotted to him on the public range.

In the early days a cattleman grazed his cattle year-long, mostly on the open range. Livestock numbers were low then and native forage was abundant. However, the business was more of a gamble than it is today. When a cycle of so-called good years, with lots of rain and not too much snow, came along feed was plentiful. The herds produced calves economically, and the beef stock was trailed to market. On arrival, the rancher cashed in. Both he and his cowboys made a big splash about town for a few days. The rancher then usually built a big house and bought high-powered cars, thereby making a lasting impression of cattle riches and romance on the city populace.

On the other hand, when it didn't rain the grass withered, the ground parched and the cattle died of starvation. When it snowed too much the forage was covered and the cattle perished in the cold. In either event the cattleman went broke and the cowboys found it tough going until another cycle of good years rolled around. Needless to say, cycles of wet summers and light winters were few and far apart.

The early-day rancher had to

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be a good rider and roper and a rugged individual because his life was largely spent on the range or on the trail where he had to cope with the rigors of the elements. His skin became leathery from facing the weather and his eyes got chicken-tracked looking into the sky and squinting at the sun, hoping for rain. The ranchers' and cowboys' problems in bucking the elements seemed, and often were, insurmountable.

While we admire and respect the ability and ruggedness of the early-day cattleman and cowboy, still the business today requires more ability, scientific knowledge and exactness than ever before. However, there is less gamble in the business now than in the old days, although the present-day cattleman does have some new hurdles to jump.

For instance, during recent years of high prices and good profits most ranchers, like other business men, have found it difficult, because of the income-tax take, to accumulate a sizeable reserve for retirement or possible business reverses. Obviously, for self-preservation, the cattleman now has to take as much of the gamble out of the business as possible. He not only finds it necessary to produce a reserve of hay for drouth or hard winters but also to grow considerable pasture and grain to round out his feed requirements.

This hay, pasture and grain production requirement of the present-day cattleman puts him squarely into the business of farming. He soon finds that farming is an exacting science. He learns that soil handled improperly results in a failure, while the same soil properly handled will respond with a bountiful crop.

He also finds that losses are sustained unless the crops are harvested at the right stage of maturity. For instance, the harvesting of hay a week or two too early will reduce the tonnage one third or more, while harvesting it a week or two too late finds its green color, vitamin and protein content leached out and much of its nutrients absorbed back into the plant's root system. In either instance the cattle suffer. Mother cows become temporarily sterile when fed on a diet deficient in vitamins and protein. As a result, low calf crops and a small beef tonnage turn-off follows. Similarly, cattle will not make satisfactory gains or develop properly on such a deficient ration.

The good farmer not only has to be a cultural expert but also must know the way to lay out his irrigation system and handle his water to avoid ruining his land. In a few years, under improper irrigation methods, he can erode his land and wash valuable soluble elements out of the soil which nature cannot replace or cure in a century, if ever. The farmer-cattle-

man of today carries a grave responsibility, whether he appreciates it or not. If this generation wastes the soil, the next generation and the general public will suffer for it.

A good cattleman of this generation handles his soil for sustained production and produces and harvests his crops properly. When he produces and gives the cows enough of the right kind of feed they know how to produce calves and seldom need a midwife to get the job done. In my opinion, if all the cattlemen of the West were immediately to become good farmers our cattle-production efficiency and beef output would increase at least 15 per cent. That would mean more wealth for the industry, a sounder state economy and more meat for the people.

It is harder to be a good farmer than to be a good, old-fashioned range cattleman. In fact, some range cattlemen wouldn't have a cattle-farming ranch because they say that the enterprise is too confining, exacting and requires too much scientific supervision. But it seems clear to me that in the future to be a good rancher one has first to be a good farmer.

Meadow Crop Silage

Condensed from The Rural New-Yorker

A. D. Pratt

The development of meadow crop or grass silage is largely an outgrowth of the attempt to improve on bluegrass pastures. Research workers and dairymen have found that fertilization would make bluegrass available two weeks sooner in the Spring. Fertilization also increased the yield by 50 to 100 per cent, but did not change the nature or growth habits of bluegrass. It still was semidormant in July and early August. Only in seasons with phenomenal rainfall does bluegrass furnish abundant pasture in midsummer.

The swing to a mixture of grasses and legumes makes surplus growth available for haymaking or ensiling. In experimental tests smooth bromegrass has proven more satisfactory than orchard grass or timothy, for it makes greater growth than either when rainfall is limited, and it also makes a hay that is more palatable than orchard grass.

Ladino clover has found a place generally in these mixtures. It

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makes excellent grazing and also excellent silage. As a hay, it is difficult to cure, even in mixtures with non-legumes. Ladino is good also because, when the cows are removed and the field is clipped, Ladino increases to replace alfalfa which usually decreases with heavy grazing and clipping.

Meadow mixtures which are most suitable for a particular farm or field will vary with local conditions and soils. It is therefore best to consult with the county agent before making a new seeding so as to find out what is best adapted to the particular conditions involved. In most sections, however, by using suitable seed a triple-purpose mixture can be obtained, which will be good for either hay, meadow crop silage or pasture. One such mixture recently recommended by the New York Station as being desirable for use on fertile, well drained soils, consists of the following, per acre: alfalfa four quarts, ladino clover one-half quart, and smooth brome-grass 19 quarts. The New Jersey Station suggests the following triple-purpose mixture per acre for productive, well drained soils; alfalfa five pounds, red clover three pounds, ladino clover one-half pound, and smooth bromegrass 10 pounds. For poorly drained soils the New Jersey recommendations are: ladino clover one pound, alsike clover three pounds, reed canary grass eight pounds, and timothy four pounds. At the New York Station two possible mixtures are offered for permanent pasture use, where alfalfa is not suited to the soil. Depending on the farmer's preference for timothy, these mixtures include (1) Birdsfoot trefoil two and one-half quarts, and timothy three and one-half quarts: or (2) Birdsfoot trefoil two and one-half quarts, and smooth bromegrass 18 quarts.

The use of these meadow crops for pasture usually means a surplus of pasture at the time when bluegrass is at its peak. If the bluegrass is left and the meadow crop grazed, the bluegrass becomes too mature for grazing and is lost. In such a case the alert dairyman grazes the bluegrass and cuts the meadow crop for hay or silage.

Because of the realization of a need for control of soil erosion, meadow crop silage is here to stay. In practice the making of meadow crop silage reduces the need for corn silage. In the Northeast the reduction of the corn area will be a greater advantage than in comparatively level central or western Ohio where corn thrives and where erosion is less of a problem. Any change in farm practices that reduces the peak labor load results in reducing the overall cost of production.

When the dry matter content of the ensiled material is less than 30 per cent, the material should be

wilted before ensiling or some kind of preservative should be added. The Bureau of Dairy Industry Experimental Farm at Beltsville, Maryland, has ensiled satisfactorily without preservatives for several years, and the authorities there recommend that procedure. If a dairyman is just beginning to ensile meadow crops and is uncertain about the degree of wilting necessary, he may wish to use a preservative as a form of insurance.

When meadow crops have been cut and there is no sun for wilting, the addition of 100 to 200 pounds of corn-and-cob meal or corn meal or even of hay, at the ensilage cutter, will increase the dry matter content of the silage. The added carbohydrate at the time of ensiling furnishes fermentable material for acid formation. Hay acts merely to increase the dry matter content.

Electrical driers are available for rapid determinations of moisture in silage or in material that is to be ensiled. A chemical balance that weighs in grams is necessary also for making the dry matter determinations. Grasp a handful of the cut material and squeeze it in the hand. If the material stays in a ball when the hand is opened, it is too wet for ensiling without some drying material; if it falls apart, it is not too wet.

The use of molasses in material that is too wet for ensiling satisfactorily does not improve the silage from a moisture standpoint. Molasses seems to draw juice out of the plant tissues. However, molasses added to a meadow crop of proper moisture content provides the necessary fermentable carbohydrate and makes an exceedingly palatable silage. Even surplus bluegrass that is not too mature, when preserved with corn meal or molasses, makes a highly palatable silage.

Meadow crop silage can be no better than the crop from which it is made. While over-ripe material may be more palatable as silage than as hay, ensiling does not decrease the fiber content or increase the protein. Material that has bleached in the field by excessive sunning or by rain will not make the best silage. Meadow crops that are ensiled in good condition make a silage containing more carotene than does corn silage.

For three consecutive Winters, meadow crop silage has been fed in comparison with corn silage at the Ohio Station. Three years ago, the milk production from meadow crop silage was practically the same as from corn silage. Two years ago the quality of the meadow crop ensiled was low, and the production was only 90 per cent as much as from corn silage. Last Winter the production from the two was equal again. Usually the carotene content of meadow

crop silage is higher than that of corn silage. This is desirable, especially when the hay is not of high quality.

The protein content of meadow crop silage is higher than that of corn silage but depends on the legume content of the meadow crop. Likewise, when legumes are present in a high percentage, the mineral content of the silage is higher. Generally speaking, meadow crop silage, when of good quality, should be equal on a dry matter basis to corn silage.

The superior protein content of meadow crop silage permits use of a grain ration with a lower protein content, thus affecting an economy in production.

Cows that have never had meadow crop silage may not eat it readily at first. Animals that have received only meadow crop silage for two or three years may be just as hesitant to accept corn silage when it is first offered. The cow needs to be educated to the new flavor. When changing from a silo of corn to meadow crop silage, the change should be made gradually over a period of several days.

During our feeding experiment last Winter, two Holstein cows ate 82 pounds of meadow crop silage per day, one ate 80 pounds, and others ate up to 76 pounds, while Jerseys ate up to 60 pounds. At the same time, cows in the other group ate up to 72 pounds of corn silage with an equal percentage of dry matter. After both groups had been fed meadow crop silage and were accustomed to its taste and at the completion of a feeding period, the silages were reversed; that is, the cows that had received corn silage were given half grass silage and half corn silage, and those that had been fed grass silage were given half corn silage and half grass silage. The cows were observed at the time they were eating the last of the feeding of silage. Most of those cows that had previously been fed corn silage ate the grass silage first, while most of those that had previously been fed grass silage, ate the corn silage first.

Where The Small Turkey Fits In

Condensed from The Farm Journal

Vernon Vine

THERE was a near-record crop of turkeys on U. S. farms in 1949, and plenty of them went to market at a loss.

But down in Virginia's Shenandoah Valley, and here and there across the country, a handful of growers pocketed pleasant profits.

They grew "Beltsville small whites." Their breed was first introduced in 1941, when it was hailed as an "apartment-size" turkey that would revolutionize the market.

1948 was the first year that Beltsvilles went to market in sizeable numbers—and they yielded smaller profits than the big, broad-breasted bronze birds. Last year Beltsvilles hit pay dirt, and the breeders are calling them the turkey of the future. Are they right?

Let's take a quick look at the turkey situation before we answer that question.

We've nearly doubled turkey consumption since the pre-war years. *Last year we ate one-fifth more pounds of turkey than of lamb and mutton.*

Turkeys began their rise in importance when the broad-breasted bronze was introduced in 1930. War-time shortages of red meats put them into the big time.

But those big broad-breasts are a handicap now in holding the gains turkeys have won. At 26 weeks, range-reared broad-breasts average 20 pounds—14 to 20 pounds for the hens; 18 pounds and up for the toms, which often top 30 pounds.

That makes them far too big for most modern ovens and modern families—both of which are smaller than they used to be. Cut-up turkey, half-turkeys, and turkey steaks haven't made turkey an every-day meat dish on the family table, as promoters hoped.

Ninety-five per cent of the people still want whole turkeys, says H. L. Norman of Charlotte Hall, Md., who retails 10,000 birds a year. To cater to their tastes, Norman is producing what he calls a "medium broad-breasted bronze." But it's still a far heavier bird than the Beltsville.

Beltsvilles reach prime slaughter condition at 22 weeks, when the toms average 15 pounds, and the hens average 9 pounds, live. They were deliberately "designed" by USDA scientists, who combined the blood lines of Bronze, Broad-Breasted Bronze, White Holland, Black, White Austrian, and wild turkeys.

Reprinted by permission from The Farm Journal,
Philadelphia, Pa., March 1950

Beltsvilles had little chance to make a showing during the war, when the demand was for tonnage. They didn't do so well in 1948—when the turkey crop was small.

But as the first birds moved to market last year, Virginia farmers (who grow about half of the Beltsvilles in the U. S.) were getting 43¢ a pound for *both* their hens and their *toms*. Their broad-breasted hens were selling for 38¢, and their broad-breasted toms for 30¢.

That meant a premium of 10¢ a pound for Beltsvilles.

That's just about what many persons, including the USDA men who bred Beltsvilles, say these small birds need to hold their own, since they weigh only three-fifths as much as broad-breasts.

While there are some savings, most growers say they can't raise enough more Beltsvilles with the same labor and equipment to make as much tonnage as they can from broad-breasts.

There are exceptions. E. C. Compton of Greene County, Va., who grew 10,000 Beltsvilles and 5,000 broad-breasts last year, says: "In the case of equal prices, I'd rather grow whites. I make nearly the same net income per bird! I've got less investment all along, and a month shorter growing season with that much less chance for loss and disease."

But Mark Logan of Rockingham County, Va., who grew 5,500 whites and 7,500 broad-breasts and blacks in 1948 (he had no whites in 1949), says he needs a dime a pound premium on whites to make as much as he can earn from his big, broad-breasted bronzes.

Can growers depend on that premium?

Dr. H. R. Bird, head of poultry investigations for the USDA at Beltsville, says: "The large turkey is undeniably cheaper to produce. However, an over-production of large birds caused large turkeys to be sold at considerably less than the cost of production, while small birds could still be sold at a profit.

"There is a very important place for a small-type turkey until the consuming public can be converted to the use of the large birds at a price profitable to the grower."

Vic Pringle, sales manager of the Rockingham Poultry Marketing Co-operative of Timberville, Va., agrees. Pringle probably has sold more Beltsvilles than any other man in the U. S. He believes we already have over-supplied the hotel and restaurant trade with the super-heavy broad-breasted toms.

Pringle thinks Beltsvilles some day may account for as much as a third of all the turkeys grown in the U. S. That, he believes, would give buyers a properly-balanced

choice of weights all the way from seven-pound turkeys up.

Once Beltsvilles get established on a market (it takes only one season) it's been impossible so far to meet market demands, Pringle says.

Somewhere along the line the cost of growing Beltsvilles may come down—when poult supply catches up with demand. It costs less to produce Beltsville poults, because Beltsville hens produce more fertile, hatchable eggs than broad-breasts. Because they eat less, they cost less to carry. But so far, Beltsville poults sell for nearly as much as broad-breasted poults.

So long as Beltsville numbers continue to increase, the biggest and surest profits will be made by the men who produce Beltsville hatching eggs and poults.

Chemotherapy

Condensed from American Fruit Grower

James G. Horsfall
Connecticut Agricultural Experiment Station

A TRADITIONAL American slogan is "It's time for a change." The control of plant diseases has reached the stage where it's time for a change. I submit that chemotherapy offers the opportunity.

In the control of plant diseases, up to now, we have relied chiefly on resistant varieties or on chemicals sprayed onto the surface of plants. These are good, reliable methods; but crops still have large numbers of pests which we cannot fight effectively.

Most of my research in plant pathology has been on external medication of plants with fungicides. I have treated the soil, dusted the seeds, and squirted the foliage of all sorts and conditions of plants. It was a great field for research. It was a great method for controlling plant diseases; but it is outmoded.

The new frontier is to control them by internal medication of the plants. The preferable technique, of course, will be to apply the chemicals in the fertilizer and allow the plants to take them up.

Chemotherapy is still largely in the experimental stage. The fertilizer distributor has not replaced the sprayer and duster as the method of controlling plant parasites, although they have been controlled by this means on a laboratory and pilot plant scale. We must get the "bugs" out of the technique and reduce the problem to practice. The objective in this

Reprinted by permission from American Fruit Grower, Cleveland, Ohio, February 1950

"article" is to describe a little of the research that we of the Connecticut Agricultural Experiment Station are doing in this intriguing field.

Chemotherapy was the happy hunting ground of quacks for generations. Holes of tree trunks have been filled with horrendous materials for hundreds of years, but with little effect on the diseased tree. Recently, we received a section of an elm log which had been treated for some fancied ill. The bore hole had long since healed over. In fact, it was 40 years deep in the tree. Whether the tree was sick or not, we shall never know. The treatment chemicals were still present—sulfur and soot. Perhaps the tree lived in spite of the medication.

Chemotherapy means, literally, "treatment with chemicals." If we used the literal definitions, spraying a tree with chemicals would be chemotherapy. In practice, we prefer to limit the term to internal treatment with chemicals. This is the sense in which our medical colleagues use the term. In fact, it was coined by Ehrlich, the famed German chemist and physician, to cover his researches into the use of organic arsenic compounds to combat syphilis. Salvarsan was the outcome of his research. Penicillin is its modern counterpart.

Chemotherapy of plant disease, then, is the internal treatment of plant diseases by chemicals. The technique of applying the chemicals is unimportant. It makes no difference whether the chemical is injected directly into the plant, or whether it is allowed to be absorbed through the leaves by foliage sprays, or through the roots by soil injection.

The first modern research in America to show promise in chemotherapy is that of F. L. Howard in Rhode Island who showed that a yellow dye (orange Helione) would alleviate symptoms of the bleeding canker of maple.

Presumably, chemotherapy has a chance to work on any type of disease for which we now do not have good methods of control. At present, this includes most virus diseases, root rot diseases, and wilt diseases.

We are not wholly defenseless against these diseases, of course. To escape leaf roll, a virus disease of potatoes, Florida farmers must buy their seed potatoes 2,000 miles away in Maine, and peach growers can control X-disease of peach by killing out the chokecherries. It would be pleasanter to control these diseases with chemicals applied to the soil. Chemotherapy appears to be a "natural" for trying to control all of the new virus diseases of stone fruits. In fact, it is being investigated to some degree for these diseases.

We can ameliorate the damages

from root rot diseases by rotation, and we have had some success in breeding for resistance to some wilt diseases. Still, by and large, we are pretty helpless in the face of these three serious types of diseases. Dutch elm disease pushes its way down the streets of New England and elsewhere, leaving stark stubs behind it.

Chemotherapy can act in two possible ways: by curing sick plants and by protecting against attack of disease.

In many, many cases the ideal would be to have a chemical that would cure a sick plant. Then we could wait until Dutch elm disease or cherry yellows struck before getting to work. This is, however, an exceedingly tough nut to crack. The attainment of this ideal on a practical scale should earn a Nobel prize for the lucky researcher. This is done every day with animals. The results are nothing short of miraculous. In fact, penicillin earned a Nobel prize for its discoverer.

The plant pathologist is not so lucky as is his medical colleague. Therefore, he will have to have more time before he attains his objective. Plants do not have circulation systems comparable to those in animals. Plants cannot bathe an infection pocket with a blood stream carrying a curative drug.

In fact, the plant has developed during the ages a defense against disease that practically defeats this approach to treatment.

The plant attempts to wall off an infection pocket with special cells or gummy deposits. The best known horticultural example of this is the shot hole disease of the peach. The leaf combats the bacterial infection by laying down a layer of protective cells around it. As soon as this is accomplished, the infection pocket is shed, leaving a hole in the leaf.

Obviously, any layer of cells or gums designed to wall off an infection pocket will also seal off the infection pocket and retard the penetration of a curative medicine. At this stage in our knowledge some pessimism surrounds the practical cure of infected plants, but research goes on. Obviously, the first efforts should be directed at diseases which the plant does not attempt to wall off.

A few cases of laboratory cure are on record. Mr. Stoddard of this Station has succeeded in curing peach buds infected with X-disease. This is the first case on record where a virus disease has been eliminated from living plant tissue. It occupies considerable space in textbooks on the subject. Stoddard accomplished his objective by soaking isolated buds on short bud sticks in the proper chemicals, notably quinones and oxyquinoline compounds. Cure has not been successfully attained on big peach trees, however, de-

spite extensive efforts in that direction.

We have devoted even more effort in trying to cure elms sick with the Dutch elm disease, but without marked success. If Dr. Dimond injects 8-hydroxyquinoline benzoate into sick elms with wilted leaves, the leaves will recover and the tree will look normal the rest of the season. When this was first observed, we were jubilant; but the joy was short-lived. The trees died during the winter. A few very very slightly affected trees appear to have recovered. One of the reputable tree experts claims to have cured sick elms with potassium permanganate injections, but we have not been able to duplicate his results.

A little bit of research by Ark in California on the crown gall disease showed that Elgetol and a few other chemicals gave evidence of curing the affected plants. Brown and Heep claim to have cured plum tissue infected with bacterial spot. They treated the budwood with streptomycin.

Prevention of disease looks more promising than cure, however less to be desired. Stoddard has found several chemicals that show promise for X-diseases of peach. Calcium chloride and zinc sulfate have shown field promise when soaked in the soil around the trees. Other chemicals have shown real promise in the laboratory and greenhouse, although these have not yet had adequate trial in the field.

8-hydroxyquinoline benzoate, which fails as a curative agent for Dutch elm disease, seems to have promise as a prophyllactant. It is enjoying commercial use on a small scale at many places in the Northeast. It works best when injected into the soil around the roots in the spring before the first flight of bark beetles in June can spread the disease. The standard dose is two ounces per three inches of trunk diameter at breast height.

The fusarium wilt of tomato is a good "guinea pig" for greenhouse research on chemotherapy of the vascular wilt diseases. Four or five chemicals show themselves able to prevent absolutely the attack by the fusarium wilt disease. None of these has had field trial yet, but one or two, notably 8-hydroxyquinoline benzoate, show promise for the wilt disease of chrysanthemums and carnations in commercial greenhouses.

Up to now we have been hampered in our research by the necessity of screening methods and chemicals simultaneously. We see some light ahead on the methods. We hope soon to be able to devote more time to chemicals, less to techniques. We hope that still other researchers will initiate research in chemotherapy. It's time for a change!

Knock Spittle Bugs With BHC Spray

Spittle bug control with benzene hexachloride spray increased first cutting alfalfa 57 percent at Ohio Experiment Station. For a cost of $2.50 the dry weight of the crop cut June 7 was boosted from 2 to 3¼ tons. The spray, made by mixing 2 ounces of the effective BHC in 100 gallons of water, was applied April 29. Control of the bug was reported as practically 100 percent effective.

Infestation of spittle bug was unusually heavy in large areas of Ohio in 1948. Some farmers reported the insects so thick they choked tractor radiators when the first crop of clover and alfalfa was being cut. Alfalfa and clover are usually attacked the latter part of April.

Heavy infestations literally suck the life from the plants, causing them to turn yellow.

Adult spittle bugs are brown in color and often are identified as leaf hoppers. The young form the foamy masses on the plant from which they get the name spittle bug. When the insects mature the middle of June in Ohio they take wing and scatter thru clover, alfalfa and other crops. They also attacked strawberries, stunting the plants and fruit. Damage to alfalfa in July may be severe and is often confused with leaf hopper injury.

Benzene hexachloride gave better results than DDT in the Ohio test. DDT killed adult bugs but did not get the young encased in spittle masses. When the bugs are found on every third clover or alfalfa plant, treatment is in order, Ohio entomologsts suggest. Early treatment is best because it gets the young bugs before they have had a chance to do their damage, and there is less plant growth to cover. Early application also aids in controlling the clover leaf weevil, which also attacks alfalfa.

A high pressure sprayer is best for field treatment. A hand sprayer may be sufficient to cover the strawberry bed. The BHC may also be applied as a dust. Entomologists caution against putting BHC on berries within 2 weeks of the first picking or on hay crops within 3 weeks of the first cutting

—*Cappers Farmer*
Topeka, Kansas

Fat Steers From Pasturage

Condensed from The Cattleman

C. J. Whitfield and J. H. Jones

THE Amarillo Conservation Experiment Station had twenty grass fat two-year-old steers on the Fort Worth market September 19, 1949. The steers averaged 1271 pounds and sold for $24.00 per cwt. Veteran livestock men on the Fort Worth stockyards praised them for good quality and for weight and finish for age.

The steers averaged 1361 pounds at the Amarillo Station. Their shrinkage en route market was 6.61 per cent. The dressed yield based on hot carcass and market weight was 64.53 per cent. Under the government standards of grading eleven were high good and nine were low good grade.

These steers were purchased as calves from the Bivins Estate Ranches of Amarillo, November 1, 1947, at $23.00 per cwt. Although received with an average pay weight of 410 pounds on November 2 the calves were not weighed individually until December 1 when they averaged 444 pounds. They were wintered during 1947–1948 principally on wheat pasturage and bundles and on April 1, 1948, averaged 555 pounds. This was a winter gain of .91 pound daily. On September 28, 1948, the steers averaged 933 pounds showing a gain of 378 pounds per head in 180 days or 2.09 pounds daily.

The steers were fall grazed and again wintered, making use of such wheat pasturage as was available, also being fed cottonseed cake on native grass. During both winters, 1947–48 and 1948–49, they were fed either ground bundles or bundles, being kept plentifully supplied during bad weather. As the gains indicate they were not on a full feed of concentrate but could be considered as being well fed. They were given an average of 1.78 pounds of cottonseed cake per day during the winter of 1947–48 and 3.28 pounds in 1948–49. On April 4, 1949, they averaged 1127 pounds showing a gain of 194 pounds in 188 days from September 28, 1948, to April 4, 1949. The average final weight at the station September 17, 1949, was 1361 pounds as previously noted. The summer gain for 1949 was 230 pounds in 166 days. The total gain from December 1, 1947, to September 17, 1949, was 913

Reprinted by permission from The Cattleman,
Fort Worth, Texas, December 1949

pounds per head or 1.39 pounds daily for 657 days on the station.

The summer gain for 1948 is considered exceptional. The winter gain for 1947–48 was below the average of winter gains usually secured on steer calves at the Amarillo Station. The summer of 1948 was comparatively dry, but rainfall for the summer of 1949 was exceptionally favorable for grass. The summer gain for 1949 cannot be considered high as the steers were becoming very fat, and rates of gain are slowed down as fattening increases.

Experimental work with pasturage at the Amarillo Station since 1942 has shown that with favorable rainfall year round green feed may be realized from a combination of the following pasturage:

Winter—Winter wheat, crested wheatgrass, western wheatgrass.

Spring—Crested wheatgrass, western wheatgrass, little barley, early weeds.

Summer—Blue grama, buffalograss, Sudan grass, lake weeds.

Fall—Crested wheatgrass, western wheatgrass, winter wheat.

A flexible program of grazing which will provide ample forage during good seasons and leave enough carry-over grass for emergencies is desirable according to the experiments. The station's grazing management is based on the idea of keeping plenty of forage before the steers, then removing them before the pastures are stripped. Flexibility in the grazing program is necessary because recurrent drouths reduce the capacity of the pastures.

The station practice is to buy choice feeder steer calves, winter them well, taking full advantage of wheat pasturage, then to put on good early spring gains even at the expense of grazing out small acreages of wheat. Then, if summer feed is not in sight, to reduce numbers by sale. Further, steers are not held over winter, and calves are not bought in the fall unless there is ample pasturage and bundle feed.

Under ideal conditions the cool-season grasses, crested and western wheatgrass, bridge the gap between wheat pasturage and the summer grasses in both spring and fall. The cool-season grasses are able to use either early spring or late fall moisture which the summer grasses cannot use because of cold weather.

It is not reasonable to expect winter wheat and cool-season grasses to make such growth in winter. However, given moisture and freedom from excessive cold, a great deal of valuable pasturage is produced. In its use excessive trampling and grazing must be avoided as such treatment may cause wind erosion.

It is very desirable to have a green pasture to keep steers gaining in case they are taken off

wheat ground about March 1. Studies at the Station have indicated for maximum grain production livestock should be removed from early maturing wheat varieties not later than March 1 and late maturing varieties by March 15. Crested wheatgrass and western wheatgrass have proved to be adapted to this purpose. Under drouth emergency conditions these grasses have been used in midsummer.

Blue grama and buffalograss native pasture may sustain steer gains throughout the summer. Such pastures, however, have produced little steer gain in the fall except under unusual conditions. Values of all the pasturages for beef production have varied from year to year with climatic conditions.

Drouths of two successive growing seasons may be expected and plans should be made in advance. Under semiarid conditions native and seeded pastures which are heavily used lose their vigor and respond slowly to moisture. On the other hand an accumulation of grass beyond the need for soil protection may reduce the growth of new forage, and a total forage somewhat low in food value may result. In a single season heavy use keeps the forage green as long as moisture is available. Light use permits some of the grass to cure, weather and lose food value, but the vigor of the pasture is maintained; cattle are able to select the best feed and to make high gains. The extent to use pastures does become a matter of judgment, but over a period of years the experiments indicate light to moderate use is best.

It is only through light use that maximum gains per steer can be realized from pasturage. Hence, carrying through fewer good quality steers with maximum gains may be more profitable than carrying through a large number with poor gains. Certainly the pasturage will be in better condition for the on-coming year.

Makes Soy Meal Equal Tankage

Soybean meal can replace tankage for fattening pigs when they have good pasture, Indiana and Pennsylvania tests show. Pigs on shelled corn and pasture at Pennsylvania made faster gains when soybean meal was their only protein than when meal was mixed with tankage. Mineral mixture was 2 parts ground limestone and 1 part salt.

All feed was self-fed. Pigs ate more soybean meal when it was served alone than when it was mixed with tankage. Daily gain was 1.24 pounds for soybean meal compared with 1.10 pounds for the protein mixture.

Weanling pigs on alfalfa pasture made the same daily gain with soybean meal as they did with tankage, in Purdue University tests. Ration for pigs that got tankage was ground corn, 70 pounds; wheat middlings, 20 pounds; 60 per cent tankage, 10 pounds; and mineral mixture. The soybean ration was corn, 68 pounds; middlings, 20 pounds; soybean meal, 12 pounds; and mineral.

Soybean meal compared favorably with tankage in rations for dams of pigs in the Purdue experiment. The mature sows were on bluegrass pasture for 5 months before they were bred for spring litters. They were divided for winter dry lot feeding. One group got shelled corn, whole oats, tankage and mineral. For the other lot soybean meal was substituted for all the tankage.

Litters from sows on soybean meal averaged 11.45 pigs compared with 11.26 for those fed tankage. Pigs from sows getting the meal averaged 2.73 pounds, while those from dams fed tankage weighed 2.62 pounds.

In the suckling ration, corn was ground and wheat middlings were substituted for oats. Proportions of tankage and soybean meal were increased. Sows on meal weaned 8.61 pigs a litter while those on tankage brought only 7.68 pigs to weaning age. At 8 weeks, pigs from the meal-fed lot weighed 1 pound less than those from sows that got tankage.

Hogs eat excessive amounts of soybean meal when it is self-fed alone. To hold down consumption, Purdue swinemen add 1 pound of simple mineral mixture to 5 pounds of meal. At that proportion the shote will eat two-thirds pounds of meal a day, which is enough for its protein requirements.

—Cappers Farmer
Topeka, Kansas

Aluminum In Farm Buildings

Condensed from Poultry Tribune

Deane G. Carter and R. W. Whitaker
University of Illinois

AN aluminum poultry house for your farm? At first thought this seems like a novel idea, but actually you can use aluminum to good advantage for siding, roofing, windows, ventilators, and feed hoppers in the laying house. And what's good for poultry house construction also may be used for other farm buildings.

Last year, the University of Illinois College of Agriculture announced a poultry laying house built largely of aluminum. It was designed mainly as a "laboratory" to study the uses of aluminum products for farm buildings. Now, after more than a year of testing, the house appears to be entirely practical for the farm. Good conditions were maintained in the house; production was high; and no disadvantages were found.

The house as it was built at the University of Illinois follows the usual recommendations for the farm-sized flock: concrete floors, south-front windows, droppings pit, deep litter, electric lights, and overhead insulation. One 100-hen unit, or one-half of this house, is the strawloft type which many farmers like. For comparison, the other 100-hen unit was lined with insulation on sidewalls and ceiling. In both cases, aluminum sheets were applied on strips or solid sheathing in the sidewalls, and over nailing strips on the roof.

Still more important, we learned how to select and nail aluminum sheets, fit windows, and, in general, make the best use of this new farm building material. As a result of the experimental work, we have a number of answers to questions farmers ask about aluminum.

The important precautions to observe in using aluminum sheets are: (1) build up the foundation to put the metal above the level of the litter on the floor; (2) use nailing strips spaced according to the thickness of the sheets, ranging from solid boarding up to strips spaced two feet apart; and (3) use screw-shank aluminum nails with lead heads or plastic washers, and apply them according to directions furnished by the manufacturer. You can, if you wish, use aluminum window sash, aluminum foil insulation in walls, and aluminum nests and feeders.

Reprinted by permission from Poultry Tribune,
Mount Morris, Illinois, February 1950

Most farmers are interested in barns, cribs, machine sheds, and garages, as well as poultry houses. Aluminum can be used for siding, roofing sheets, and windows on these buildings. If you do not care for the usual corrugated sidewall sheets, you can obtain aluminum that gives a horizontal siding effect. Some types are pre-treated to take paint; others come with a permanent factory-applied finish.

Questions always are raised about the value of a new building material—its cost, faults, and practicality. Here are some of the questions often asked, and the answers based on experimental studies and observations made during the past three years.

1. *How does the cost of aluminum sheets compare with other materials that might be used?*

The cost will be more. In East Central Illinois we were quoted the following prices: For 3-in-1 asphalt shingles, $7.25 a square; 28-gauge galvanized sheets, $9.25; and aluminum .019 thickness, $11.25, and .024 thickness about $15.00. Of course, some variation in prices may be expected in different areas and at different times.

2. *What should I look for in buying aluminum sheets?*

Most sheets have 1¼-inch corrugations; you also can obtain 5-V crimp, smooth sheets. Make sure the sheets have been stored in a dry place and have not been bent, broken, or twisted. Get instruction books in order to select the right length sheets, and make sure you provide the recommended nailing and stripping or sheathing.

3. *What gauge or thickness is the most practical?*

Generally choose .019 or .024 thickness for farm buildings, as these usually are found in dealers' stocks. Industrial sheets, .030 and .032, are more expensive, but they handle well, look good, and save a great deal on sheathing.

4. *What spacing of nailing strips is necessary?*

It is often practical to use solid decking or sheathing. In any case, do not space nailing strips more than 8 inches apart for either .019 corrugated or .024 in V-crimp. You can use spacing up to 18 inches for .024 corrugated and 2 feet or more with .030 sheets.

5. *How should aluminum sheets be nailed?*

Use screw-shank or ring-shank aluminum nails with weatherproof washer. Nails 1¾ inches long are sufficient to penetrate the nailing base on new construction. Drive nails into the top of corrugations. Drive the nails down until they fit tight, but do not dent the roofing sheet. Obtain manufacturer's instructions and space nails accordingly—usually about 100 nails to the "square" (100 square feet.)

6. *Will aluminum roofing draw moisture or sweat?*

The roofing will not draw moisture, but it will condense moisture and "sweat" like any metal surface when inside air is warm and moist as compared to the outside. The remedy is to follow established recommendations for poultry and animal buildings in regard to insulation, temperature, and air circulation.

7. *Will concrete, moist earth, and manure cause aluminum to break down?*

Yes, it is necessary to keep aluminum away from contact with other material that is likely to be wet, soggy, or damp much of the time. Contact with manure will cause aluminum to break down after a time. It will not be damaged by dry concrete or ordinary wood framing, nor by the moisture conditions common to good poultry houses or barns.

8. *Will aluminum sheets creep, pull, or buckle?*

Aluminum sheets may buckle if applied on light framing that tends to sway with the wind and cause movement of the structure under the sheets. If applied as recommended, no trouble should be encountered. As to expansion and contraction, a 100-degree change of temperature causes a difference of only about ⅛-inch in a 10-foot sheet of aluminum.

9. *Will aluminum sheets pull loose from the nailheads?*

Observe four precautions to prevent sheets from pulling loose: (1) Space nails according to maker's directions; (2) use nails of recommended type; (3) drive nails carefully so as not to dent the sheet; and (4) be sure the building frame and nailing strips are substantial enough to prevent twisting or swaying.

10. *How can I be reasonably sure of getting a good permanent job with aluminum sheets?*

Combine the foregoing suggestions to make certain of sturdy nailing base, sheets .019 or heavier, aluminum nails 1¾ inches long or longer, 100 nails to the square, and avoid contact with other metal such as steel windows, copper lightning rods, steel wire nails, or galvanized eave spouts. Then, follow manufacturer's directions for applying.

This discussion and the answers to questions are not a "sales talk" for aluminum; neither do we imply that other materials are unsuitable. Rather we have tried to give the impartial results that have come out of experimental work. Like other good materials, aluminum can be misused. Most of the troubles we hear about can be traced either to using aluminum where it should not have been used or failure in following instructions.

One Inch Topsoil = ? Bushels

Condensed from Agricultural Situation

George H. Walter
Bureau of Agricultural Economics

NEARLY everybody recognizes the necessity of preventing the wasting away of our national land resources through erosion. No other group realizes this more keenly than farmers to whom the land is a means of making a living rather than merely a "natural resource."

A farmer who is undertaking an erosion-control program on his land is up against a highly personal dollar and cents problem. He needs to know how continued erosion will affect his income and which erosion-control measures will pay on his farm.

Recent studies of the relationship between topsoil depth and crop yields offer one means by which farmers may evaluate the effect of erosion. Soil scientists have found that in many areas the loss of an inch of topsoil has a predictable effect on crop yields.

Experiments in the Northern States, for example, show that on the average the loss of an inch of topsoil from an acre of cropland reduces annual corn yields by 2 to 6 bushels, oats yields by 1½ to 5½ bushels, wheat yields by 0.7 to 3 bushels, potatoes by 5 to 10 bushels and hay by 200 to 400 pounds per acre.

A few other studies show that erosion of topsoil also reduces yields of soybeans, grapes, cotton, tobacco, and barley. However, more studies of these crops are needed before definite relationships between yields and topsoil depth can be accurately determined.

There are exceptions to the general rule that yields decline as the topsoil washes away. Some soils, particularly in the southeast, have subsoils with a better capacity for holding moisture and fertilizer than the present topsoil. On most soils, though, the subsoil is less productive than the topsoil.

Field experiments indicate that the loss of an inch of topsoil has less effect on crop yields where the topsoil is deep than where it is shallow. Yields of corn on land on which the topsoil was 11 inches deep ran about 3 bushels per acre less than on land on which the topsoil was 12 inches deep. On land with 3 inches of topsoil, however, corn yields averaged 5 to 6 bushels less on land with 4 inches of topsoil. Small grain

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Washington, D. C.

yields are even more drastically affected by topsoil depth.

These experiments indicate the importance of keeping the topsoil as evenly distributed over a field as possible. If topsoil from the higher part of a field is eroded and deposited on a lower area, the total productivity of the field will be lowered. Thus, topsoil which is washed down into the low part of a field is much less productive in its new location than it was back on the upper parts of the field. This is true even though it would be good farming to fill in a gully in the lower part of the field.

For instance, take a field on which the topsoil averaged 8 inches and on which corn yields averaged 68 bushels per acre. As a result of erosion, 4 inches of topsoil on the upper part of the field is moved down on to the lower portion, making the depth in this area 12 inches. Average yields on the part of the field where the topsoil is 12 inches deep might be expected to average 81 bushels—a gain of 13 bushels over the average for 8 inches of topsoil. On the other hand, yields on the part of the field where the depth of the topsoil has been reduced to 4 inches probably would average about 51 bushels—a loss of 17 bushels.

These experiments emphasize the value of keeping the topsoil in place on a field. Even though an erosion control practice may drastically reduce loss of soil from a field, it may still permit movement of soil within the field.

Usually it takes several years for an inch of topsoil to be eroded away. An inch of topsoil over an acre of land weighs about 150 tons—enough to fill three railroad coal cars. A ton of topsoil equals about 1 cubic yard. Where drainage ditches carry off topsoil, there is a double loss since crop yields are reduced and ditches or stream channels must be cleaned out or bottomlands may become flooded.

The Soil Conservation Service has estimated that soil losses per year for Iowa average about 23 tons per acre, for Illinois nearly 10 tons and for Ohio about 6 tons. On many farms, erosion losses are much higher—and a large share of this eroded soil is the valuable topsoil removed by sheet erosion.

Once the topsoil is gone, there is no way of regaining the productive capacity that vanishes with the topsoil. Crop yield studies on about 40 types of soils in 10 northern states indicate that the original material out of which a soil is formed determines the inherent productive capacity of that soil. Each inch of topsoil with its accumulation of humus and plant nutrients adds to the expected yield. Total yield of a soil is affected by cultural practices and physical conditions such as rain-

fall and temperature, but these factors have little or no effect on differences in yields resulting from variations in topsoil thickness. Treatment of the soil may help replace yield reductions due to the loss of topsoil, but the same treatment on the land before it had been eroded would have given similar increases in yields.

Elimination of all soil movement by erosion is seldom practical and rarely advocated. In most areas, a reduction in annual soil loss of between 2 and 5 tons per acre is considered an attainable and satisfactory goal. But it would require changes in farming practices on most farms. Often it would mean changes in rotations to include more acres of grass and hay crops and fewer acres of row crops. Strip cropping, contour farming, and terraces also may be needed.

Each farmer who is considering erosion control is faced with the problem of deciding how much he can afford to keep his topsoil in place. Failure to end or slow down the loss of his topsoil will mean a steady decline in the capacity of his land to produce. The loss in yields will not be matched by a proportional drop in production costs since seed, planting, cutivating, and harvesting cost about as much when yields are low as when they are high. Some costs such as those for plowing and cultivation may even rise as ditches and gullies are eroded in the fields.

A decline in production coupled with little or no decline in production costs would mean a greater decline in net income than in gross over the long run. Reduced income would be reflected in the value of the land.

Against the prospects for loss of income over the long run, the farm operator must compare the cost of an erosion control program. This might include a temporary loss in income while farming practices are being changed. To determine whether a proposed program is likely to be profitable, an analysis of farm income with and without the proposed program may be needed. Such an estimate might well be included with any conservation plan to enable a farmer to appraise its ultimate effect on his farm income.

New Chemical Speeds Cleaning

Thirty marginal milk producers in Delaware became high-grade, valuable suppliers as the result of a 13-week experiment earlier this year in which they used a new technique for cleaning milking machines and equipment with a one-step combination detergent and sanitizer.

The experiment, conducted by a Philadelphia chemical house and a large milk processor, points the way to lower bacteria count on most farms. Sixty dairy farms were included in the test. One group of 30 used the new technique and chemical; the other used a standard, commercial cleaner, followed by a separate chlorine sanitizer.

The dairies using the combination detergent and quaternary ammonium germicide were given a simple technique to follow in the cleaning operation: Before milking in the morning they drew 12 quarts of warm water through each milker unit and rinsed the other utensils with water. After milking, they drew one pailful of warm water through each unit. Then the machine was dismantled and all parts (including air hose) were immersed in the new solution (1 ounce to 12 quarts of water) for a half hour.

After the soaking, all parts of the equipment were brushed inside and out, then left to drain without rinsing (the bacteria-killing agent is active as long as there is moisture).

Before the night milking, the farmers drew 12 quarts of hot water through each milker again and rinsed the other utensils. This removed the chemical allowed to dry on equipment after the morning soak. After milking, they were soaked in the solution again and allowed to dry unrinsed.

Before the test started, 10 to 15% of the milk from the 30 experimental dairies showed a pasteurized bacteria count of 10,000 or more. At the end of the period, less than 1% was in this range. About 85% of the group at the beginning had bacteria counts between 100 and 10,000. At the end of the test, the 85% ranged between only 10 and 1,000.

The farmers liked the new detergent-sanitizer because it brought up the quality of the milk, the one-step process was simpler and easier, and the preparation did not irritate hands or damage metal or rubber.

—*New Jersey Farm and Garden*
Sea Isle City, N. J.

Paper Towels For Cows' Udders

Condensed from American Agriculturist

Dr. H. G. Hodges
New York State Veterinary College

For 15 years or more some dairymen have been trying to use ordinary paper hand towels for washing cows' udders and teats. But they have not been satisfactory. They are too thin and when immersed in water or an antiseptic solution they do not hold together.

Now, after two years of experiments and trials with paper towels designed especially for use on cows, an Eastern manufacturer has produced a satisfactory one that has been placed on the market.

Cooperating with the manufacturer were a large number of dairy farmers and veterinarians in New York who put the various experimental towels to work under actual dairy barn practices. Many of these tests were conducted under the observation of veterinarians associated with the New York Mastitis Control Program. Observations and suggestions of all these people were used in designing the towel.

One of the biggest problems in producing high quality milk is keeping dirt out of the milk. The very location of the cow's udder on her body causes the udder and teats to become soiled with dirt from the stable cow bed and mud and dust in cow yards, lanes and pastures. If the manure and other filth are not removed before milking, they may get into the milk.

Sediment in milk is highly undesirable in itself but is often made even worse by the presence of objectionable odors and high bacteria counts made by the dirt. Many authorities consider that infection is transmitted to the udder through the teats during the act of milking, by infected hands, teat cups and udder cloths. When infection is present, streptococci and other kinds of mastitis bacteria can be detected in the cloth and water and even on the outside of teats which were negative before being washed.

The best way to prevent sediment in milk is to remove dirt from the udder, teats and flank by thorough cleaning before milking. This is easier said than done because it requires a clean, sterile towel for each cow.

On the average farm, washing and sterilizing a towel is not easy. A satisfactory job requires a wash-

Reprinted by permission from American Agriculturist,
Ithaca, New York, March 4, 1950

ing machine and adequate amounts of hot water and cleaning powders. Then, after washing, it is imperative that the cloth towels be sterilized and properly stored until the next milking. Here hot water sterilization would seem advisable, but is rarely, if ever, practical.

A frequently used method of attempting sterilization after washing is to soak cloths in some antiseptic solution such as chlorine or a quaternary ammonium solution. These preparations are not effective in killing bacteria unless they come in contact with materials or surfaces free of organic matter. And it is doubtful that under ordinary washing procedures, udder cleaning cloths are free of organic matter. Towels that are dried after cleaning and sanitizing probably will be in the most satisfactory condition for use at the next milking, but this also isn't practical on most farms.

Altogether, this creates a difficult situation. Cows' udders and teats get dirty and must be cleaned or dirt gets into the milk, bringing low quality and frequent rejection at the milk plant. The use of one cloth on several cows is not satisfactory because the towel and the antiseptic solution soon become filthy and contaminated with many kinds of bacteria, some of which are mastitis producing. If individual towels are used, their care is costly from the point of labor, equipment and time consumption, and even then the towels are often not fit to use. It was this difficult problem that prompted dairymen to try paper hand towels and then spur manufacturers to produce a satisfactory disposable towel for dairy barn use.

The paper towels tested have the size and quality needed; are thick enough to pick up a fair amount of cleaning solution, and strong enough to withstand rubbing and massaging of the udder without tearing. After cleaning and massaging the udder, it is very important to remove as much moisture as possible. This makes it necessary to wring out the towels, and this can be done with the new paper towel without it tearing or breaking apart.

Many dairymen use a hot towel as an aid in stimulating the letdown of milk. A few who have tried paper towels report that they do not retain heat as long as cloths. This may be true but it is doubtful that the majority of dairymen use towels that apply a very high degree of heat anyway. However, if water heated to 130 degrees is used and kept at that temperature, little difficulty should be experienced in applying the desired heat to the udder with paper towels. Fast milking is probably accomplished more as a result of a good milking system that creates good milking habits

of the cow than it is through the use of hot towels.

Use of a clean, single-service udder-cleaning paper towel free of mastitis bacteria is not the complete answer to control of bovine mastitis and production of clean milk, but it will help.

(*Note:* The towels tested were furnished by the Brown Co., Berlin, N. H., under the trade name, Nibroc Kowtowl.)

Quick Test of Hay Cure

When is hay safe to put in the mow? You no longer need to guess. There is a quick, easy test. It can be made right in the field in 10 minutes. S. T. Dexter, Michigan State College, worked out the method and the equipment.

The tester fastens to the exhaust pipe of a truck, tractor or automobile engine. Dexter refers to it as a type of oven. A sample of hay is folded and pressed into a metal cylinder. Then cylinder and sample are weighed and slipped into the exhaust-pipe attachment.

The engine is operated a little faster than idling speed. Hot gases dry the hay. After 2½ to 3½ minutes reverse the cylinder ends. Total drying time will be 5 to 7 minutes.

Weigh cylinder and sample again. The loss in weight will be water. By using charts which come with the outfit, the amount of moisture which was in the hay before drying can be quickly read. Total time for the test is not more than 10 minutes. Several samples from different parts of the field should be run. Lots of barns have been burned because somebody guessed wrong on when the hay was ready. Hay isn't safe to mow if it contains more than 20 percent moisture. A little under that is safer. A little over will brown or char the hay, and may start a fire.

How easy it is to guess wrong was indicated in a Michigan farm meeting last summer. The crowd was asked to judge 2 samples of hay. One was dry enough to keep and the other was dangerous. Nobody in the crowd could be certain which was which.

Equipment for the test comes in a handy kit. It includes oven, metal cylinder, scale, chart for calculating moisture and directions. Dexter says he'll be glad to answer questions about the method or equipment. You can write him in care of Farm Crops Department, Michigan State College, East Lansing, Michigan.

—*Capper's Farmer*

Land Capability

T. C. Green

Condensed from The Southern Planter

Soil Conservation Service

EACH acre of land on every farm has a definite use to which it is best suited. More than 20,200 Virginia farmers have accepted the idea of using their lands in accordance with their ability to produce crops safely.

This has been done because of their real interest and belief in a complete soil and water conservation plan which considers each and every acre of land on their individual farms. They have asked for and received help from their local soil conservation district. There are 22 soil conservation districts in Virginia to date, which include 88 of the 99 counties.

The Soil Conservation Districts have organized to do something about the conservation of soil and water. A business man depends upon his annual inventory of stock or goods in order to learn of his progress. Likewise, a farmer should want to know something more about his lands and of how he might best use them safely. The Soil Conservation District has adopted the land capability principle and strongly recommends this idea to you.

Now what does land capability mean—big words perhaps, but very simple to understand and to apply.

Land capability is a short way of taking a good look at the way that Mother Nature arranged the entire acreage of the farm. We find first the soil, then the slope on which the soil lies. There is also the erosion that has taken place in years gone by. The erosion damage is often the result of farming practices which did not always provide for the conservation of either the soil or the falling rain.

Land capability then is an expression used to understand better the soil, slope and erosion conditions of each field on your farm. A proper use is also suggested for each acre of land in terms of the treatment that should be applied to the land in order to keep the soil on the farm where it belongs.

Land capability is not a cure for all land ills. It should simply be accepted as a sensible way to select and to use certain good farming practices on the land. Then there should be no further serious losses of either soil or water from any field on the farm.

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Richmond, Virginia

Contour cultivation, for example, is a safe and easily applied soil conservation practice for most sloping cultivated lands. Contour cultivation is established by just running each row *around* the hill. It is now well known that machine, man and animal power is more easily used in contour cultivation than where the rows run straight up or down the hill.

Each contour row acts the same as a little terrace to help take away any excess rainfall from a cultivated field. It is also well-known that on certain kinds of land little soil and water is lost where contour cultivation is once correctly laid out and properly maintained.

The land capability idea of land use is simply to suggest to each land owner or operator the location of each area on his farm that can still safely be used for cultivated crops, along with a common sense suggestion for the treatment of each acre. On most farms there will be some few areas which could naturally best be used for permanent vegetation. Land capability gives full consideration to such areas.

The definitions which follow are given to show how the land capability idea will fit the land on your farm. There are eight land capability classes recognized by the Soil Conservation District. The district technician and the farmer discuss in terms of land capability the needs of the farmer and together they develop safe and sound treatment for each acre on the farm.

Lands Suitable for Cultivation:

Class I—The best land on the farm—usually level land where loss of soil by erosion is not a problem—better than average yields of crops are produced with good farming practices.

Class II—These lands are usually found on gentle slopes and thus require contour cultivation to stop the losses of soil and water. Good yields of crops are produced with good farming practices.

Class III—These lands are usually found on slopes steeper than those of Class II, and need contour cultivation for clean-tilled crops combined with terraces or strip cropping to prevent damaging losses of either soil or water. With good farming practices, good yields of crops are produced. The cropping system needs to include more protection for the soil by using better vegetation in the rotation.

Class IV—While the soils themselves are often desirable to use for crops, the slope may be so steep that use for annual cultivated crops is dangerous. These lands are best safely used for close-growing vegetation in connection with other areas of pasture or hay. Where Class IV lands are necessary for cropping they should be worked into a long-time rotation

of at least four years between breaking or plowing dates.

Class V—These lands are not suitable for cultivation because of the thinness of the soil above bed rock; or, in some cases, because of the problem of removing excess water. Erosion is not a problem. These lands can safely be used for the production of permanent vegetation and, where other pastures are available on the farm, will produce very good supplementary grazing.

Class VI—These lands are usually found on steep slopes and either have already been damaged by considerable loss of soil, or they have been farmed to the point of steady losses in yields. With the application of good farming practices, including grazing control, these areas will produce very good yields of close-growing crops. The steepness of slope presents a continuous danger and a cropping system to include as much vegetation as possible will be needed to protect these areas against losses of soil and water.

Class VII—These lands have extremely steep slopes and the previous losses of soil make it wise to remove such areas from use for row crops. With a system of farming to provide a good vegetative cover and a careful program of grazing control, these lands can be safely used for the production of supplementary vegetation. In many cases, such areas when fenced from live-stock can be used for farm woodland.

Class VIII—On most farms there are those small odd-sized or shaped areas next to the woodlands; or which may be too stony or rocky to cultivate or to develop for pasture. Such areas can quite often be used to plant special crops in order to produce both food and shelter for wildlife.

Any farmer who is interested in learning more about the best use of his lands can easily do so. The first step is for him to believe he needs this kind of information. He can see for himself that many other farmers are well satisfied with the benefits of *real* soil and water conservation. These conservation farmers are actually producing better yields of higher quality crops, and are using fewer acres too. But most important of all the priceless soil and life-giving rainfall are both staying on the land where nature intended them to be.

The next step in obtaining land capability information consists of talking with the county agent, a supervisor of the local soil conservation district, or the local Soil Conservation Service technician. All of these men will be more than glad to help.

The final step is the working out of a complete soil and water conservation farm plan which considers equally each acre of land

on your farm. This plan is written only after the landowner and soil conservation district technician have thoroughly discussed all of the needs of the farmer. His needs for pasture, grain, hay, woodland and wildlife are made part of the plan.

Then comes the satisfaction gained from the conservation way of farming. Why not ask the man who is a conservation farmer—he knows that it really pays! Land capability is good business.

LAND CAPABILITY CLASSES

Suitable for Cultivation		No cultivation-pasture, hay, woodland and wildlife	
I	Requires good soil management practices only	V	No restrictions in use
II	Moderate conservation practices necessary	VI	Moderate restrictions in use
III	Intensive conservation practices necessary	VII	Severe restrictions in use
IV	Perennial vegetation-infrequent cultivation	VIII	Best suited for wildlife and recreation

Profits From Raising More Pigs

Condensed from The Hog Breeder

Carl P. Thompson
Oklahoma A & M College

A FEW YEARS AGO the United States Department of Agriculture in conjunction with several of the experiment stations made an exhaustive survey of pig losses in the hog belt. They found, upon analyzing the data, that between 30 and 35 per cent of all pigs farrowed died before they were two months of age. A large percentage of these were lost during the first few days after farrowing. Compared to this, there was a loss of only 10 per cent of the entire crop of pigs farrowed from diseases of all kinds after the pigs were weaned. The following list published by the United States De-

Reprinted by permission from The Hog Breeder, Chicago, Illinois, March 1950

partment of Agriculture gives a summary of the various causes of loss of pigs between farrowing and weaning time:

CAUSES OF PIG LOSSES BEFORE WEANING

Ave. % farrowed	Causes of Death
15.0	Overlaid
5.2	Born Dead
3.0	Chilled
2.2	Born Weak
1.5	Starved
1.1	Eaten by Sow
0.5	Scours
0.3	Sore Mouth
0.3	Thumps & Worms
0.3	Injured by Other Stock
0.1	Lost
0.1	Smothered
4.8	Miscellaneous
34.4	Total

A study of this list will reveal the startling fact that most of this loss can be prevented by proper management. By far the largest loss is from pigs being overlaid by their mothers. To prevent loss of pigs from this cause, farrowing houses should be ample in size—7×7 should be considered the extreme minimum and a farrowing pen 8 feet square is none too large.

The second cause is rough uneven floors, especially where dirt floors have been rooted up by the sow and allowed to remain low in the center and perhaps higher around the edges. Drafts cause sows to be fretful and uneasy and a house that has open cracks, especially in the north, east, or west, is bound to contribute to the loss of pigs at farrowing time.

Most people are conscious of the importance of guard rails in a farrowing pen, but in far too many cases, the guard rails, are too close to the ground and not far enough from the walls. It is not necessary, as a rule, to have guard rails around the entire farrowing pen, but in the corner of the pen farthest from the door or doors a guard rail, not less than 12 inches from the floor and anywhere from 12 to 18 inches from the wall, should be provided. This gives ample room for the pigs to get back out of the way and still provide plenty of bedding.

Too much bedding at farrowing time does more harm than good. The only bedding necessary or desirable when a litter is farrowed is chaff or fine straw enough to keep the floor dry. More bedding may be added after the pigs become older.

A great deal has been written in recent years about pig brooders. They are one of the best methods yet developed for saving pigs. Pig brooders need not be expensive. They can be built by any hog man and are extremely practical where electricity is available. Care should be taken, however, in wiring the hog house for a pig brooder. Recently in Oklahoma a valuable sow and 12 pigs, together with the hog barn, were completely destroyed when a poorly constructed brooder was used and the wiring was not safe. An ordinary light

bulb and cheap reflector are satisfactory for the pig brooder.

A good many of our most successful hog men make a practice of taking the pigs away from the sow as fast as they are farrowed, keeping them in a box until all pigs have been farrowed, allowing them to dry, and then placing them back with the sow. This is a very commendable practice and where pig brooders are used, the brooder can be used as a holding place for the pigs instead of a box. A large percentage of the pigs laid on by the sow are lost during the process of farrowing. A sow that is very restless and clumsy while she is farrowing a litter is usually very quiet for hours after the litter is farrowed. Where pigs are kept in a box, have plenty of bedding in the box and put a gunny sack loosely over the top. One man of my acquaintance smothered an entire litter by putting them in a tight box and placing a horse blanket over the box.

There is always the question of whether or not the small tusks should be clipped from pigs at farrowing time. If it is a large litter and the pigs persist in fighting and cutting each other, it is a good plan to cut these teeth, but extreme care should be taken not to injure the gums or "Bull nose" may be the result.

Every man who has ever raised pigs has learned from experience that when a sow is over-fed immediately following farrowing, the entire litter is apt to develop a severe case of scours and may even die. One of the best rules to go by in caring for a sow after she has farrowed is not to give her anything but water for anywhere from 24 to 48 hours. After this, put her back on feed very gradually so that she will not produce more milk than the pigs are able to consume.

Anemia, which is caused by an insufficient amount of hemoglobin in the blood and manifests itself in the form of thumps and scours, can be prevented by keeping fresh clean dirt in the farrowing pen. There is a sufficient amount of iron in most dirt to prevent anemia. Be sure that the dirt is clean, taken preferably from some place where hogs have not been kept, and that the dirt is completely stirred up and fresh so that the pigs will be able to root in it.

The feeding of orphaned pigs successfully is both an art and a science. Two mistakes are commonly made. First—most people attempt to dilute cow's milk for pigs when, as a matter of fact, sow's milk contains 40 per cent more total solids than cow's milk. Sow's milk is richer in butterfat, protein and ash. Use fresh cow's milk for orphaned pigs, adding a tablespoon of lime water, made by dissolving any form of lime in water and allowing the undissolved part to settle to the

bottom, to a pint of milk. This is not for the purpose of diluting the milk, but for the purpose of helping correct digestive disturbances. Keep in mind that the average pig does not consume more than one pint of milk daily for the first week or 10 days of its life and limit each pig to this amount or less. Feeding every 2 or 3 hours during the day and at least once during the night for the first week. After which the amount of milk can be increased as the pig is able to take more milk without becoming scoured.

Chemical Soil Injury

The USDA warns that serious trouble may be encountered in as short a time as three to five years on some soils and some crops after general use of certain new agricultural chemicals, if present heavy annual rates of application are continued.

How long the toxic effects of excessive quantities of DDT, benzene hexachloride, and Chlordane will remain in any particular soil is not known. How to remove toxic quantities from a soil, once applied, is not known.

On studies thus far made by the USDA and others, a given quantity of DDT is more toxic on light than on heavy soils, more toxic on soils low in organic matter than on soils well supplied with it, and more so on a given soil when its reaction is alkaline or a trifle acid than when strongly acid.

Parathion, a new synthetic chemical of great insecticidal power, appears to be highly toxic to plants when added to the soil. Growth was depressed when this material was added to Chester soil at the rate of only 12½ pounds to the acre.

Chlorinated camphene (Toxaphene), on the other hand, is shown thus far to have only transient toxicity in the soil, and is not apt to present as much hazard as some other compounds.

Remarkable varietal differences exist as to resistance to DDT spray injury. The Triumph variety was rendered unproductive by application of suspension of wettable DDT, whereas the Peerlees potato, a sister line, and 13 other varieties tested, were unharmed.

—N. J. Farm & Garden

The Animal That Paid for Alaska

Condensed from the Pennsylvania Farmer

Mabel I. Savage

THE fur seal herds of Alaska have yielded enough revenue to pay the original cost of Alaska several times. The United States paid $7,200,000 for the territory of Alaska. More than three times this sum has been realized from fur sales by the government since 1867.

There is another remarkable story back of the fur seal. It is the only animal valuable and important enough to have caused four countries to sign protection treaties. In 1911, the United States, Great Britain, Japan and Russia agreed by treaties that no seals could be captured or killed on the high seas for fifteen years.

Today, the United States has full control over the carefully regulated killing and marketing of fur seals in the Pribilof Island, off the coast of Alaska. This is the summer home of the great migrating herds which follow fish schools. They come several thousand miles from California waters to the colder waters of the North. As many as a million seals may be on the islands at one time, but only the furs of surplus males are marketed by Uncle Sam.

The fur seal is in many ways an interesting animal to study. The male may weigh five hundred pounds. The male is known as a "bull," and the female as a "cow." The young seal is called a "pup." Never does the female give birth to more than one baby seal. Young seals do not instinctively know how to swim. They must be taught this art by the patient mother before autumn migrations begin to the warmer waters of the South.

Fur seals move about by means of powerful flippers. For short distances they can run faster than a man can walk.

Reprinted by permission from the Pennsylvania Farmer
Pittsburgh, Penna. August 27th, 1949

Key To Danish Egg Quality

Condensed from American Poultry Journal

Virgil White

ONE of the cornerstones in the maintenance of quality in eggs exported from Denmark is the conscientious handling given virtually every egg sent out of the country. In my observations of Danish egg market methods, I was impressed by the fact that the people concerned, from the housewife who gathered the eggs to the stevedores who loaded them aboard outbound steamers, seemed to have a sense of the importance of the product they were handling.

The Danes are proud of the high quality of their eggs, and everyone with whom I talked revealed a sense of personal responsibility for the reputation of the Danish egg. No doubt this feeling for quality is motivated considerably by strict state laws under which packing stations are compelled to make deductions in the price of all eggs not delivered to the station in first class grade.

Education programs and stringent laws have undoubtedly contributed to the zealousness with which the Danes strive for high standards of quality in egg production and marketing. And yet, I repeatedly had the feeling that the Danish people go considerably beyond the rules and regulations in keeping up to quality standards. There was a definite consciousness of the importance of the export of eggs to this little country's national economy.

In an attempt to pin down the cause of such a consciousness on the part of the people, I first had a long talk with an official of the Danish Ministry of Agriculture, Mr. J. H. Schurmann. He is a director of the Government Control Board of Dairy Products and Eggs, whose function is to see that Denmark's rigid control regulations are observed. Mr. Schurmann said that it was only by the imposition of strong control laws that the government could project any order into the tremendous task of collecting eggs and maintaining quality standards.

"You must remember," he said, "that our egg production is extraordinarily high in proportion to the population, and a very large number of persons are engaged in it—although very few exclusively. Before World War II, Denmark was the biggest single exporter of eggs in the world. This

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was not because the production was larger than the production in other countries, but it was about 4 times as much as the domestic consumption, so there was a big exportable surplus. This made exports the dominant consideration in production."

Eggs are now collected, he continued, from about 300,000 households, numbering at least 1,500,000 persons out of a total population of a little more than 4,000,000. As a result, there is a tremendous job of collecting, grading, testing, stamping, and packing. By a system of checks through frequent inspections, the government enforces its quality control laws and impresses everyone, down to the farmer supplying the eggs, with the importance of complying with such laws.

Until a couple of decades ago when Denmark first started large scale exports of eggs, such control measures were left up to the co-operative egg-selling organization established by the farmers themselves. These associations used to impose a fine for delivering low quality eggs. A second offense drew an increased fine, and if the farmer involved did not take corrective action, he was expelled from the association.

The Ministry of Agriculture took over the supervision of egg marketing during the 1920s and replaced the system of fines with a national law which retains the basic principle of making the farmers responsible for the eggs he delivers to the packing stations. Under the law, every packing station, private or co-operative, has to make a reduction in the price of all eggs which are not of first grade quality. The eggs are sold by weight, the price being the same for large and small. Each week, the Ministry of Agriculture announces the price of first grade eggs for export purposes and fixes the deduction to be made for inferior quality eggs.

These inferior, second-grade or dirty, eggs, are then sold in the home market. The packing station has to make out a slip for inferior eggs, even if there is only one. The slip is sent to the farmer, who signs it to acknowledge the reduction and returns it to the packing station. Government Control Board inspectors make regular studies of the slips denoting inferior eggs, and the packing station can be ordered to refuse eggs from farmers who continuously deliver poor quality.

Upon receipt at a packing station, eggs are put through an elaborate process. They are tested for quality; damaged and inferior eggs are removed, and the rest are weight-graded, stamped, and packed in export cases. Since exports are the primary consideration of these packing stations, all eggs are handled with a view to shipment abroad. Weight-grading,

for example, is according to the internationally accepted categories, while stamping and packing materials conform to foreign requirements. The process functions so smoothly that eggs are ready for export marketing a day or two after collection.

I visited Danish farms and packing stations for some first-hand observations of the methods of handling eggs and found that the average flock was comprised of 100 to 200 birds, mostly White Leghorns and Rhode Island Reds. Actually, egg production on the farm level is pretty much of a side-line in the mixed farming practiced by the Danes. Just as in many parts of the United States, care of the hens is left up to the housewife, and, as is often the case on farms in this country, the hens are allowed to run around pretty much as they please.

After eggs are gathered, they are packed in special boxes left each week by the egg collector from the nearest packing station. In some outlying rural areas, the farmer delivers his own eggs when he goes to shop in town, but in most areas, the collectors go around once a week in horse-drawn carts and pick up the filled boxes. Each box holds 180 eggs, and the farmer puts in each box a slip of paper bearing his name and the date of collection. This system of collection seemed simple enough, but it was here that I was particularly impressed by the care with which the farmers and the collectors handled the eggs.

At the packing stations I visited, the equipment was generally modern, and the cleanliness was specially noteworthy, but here again to me the air of responsibility was the most impressive aspect. The candlers, graders, and men sealing the export cases were all extremely careful in their effort to see that each egg was ready to go out of the country in the best possible condition.

Candling was usually done on a large tray over a strong light. I noticed that the operators went over each egg thoroughly, and when they came across one that seemed questionable, they removed it from the tray for individual examination. In other packing stations I visited, candling was done egg by egg over a slot in the feedling line to the weight-graders. Graders were mostly of English make, but I saw a few which had been built in Germany before the war.

When I watched the Danish housewife gathering her eggs in a shallow basket and saw the egg collector coming around in his cumbersome high-wheeled cart, I found it hard to believe that any appreciable amount of eggs could accumulate from such relatively small and simple sources. The modern equipment and precision methods at the packing stations

indicated that the flow of eggs was larger than those sources might suggest.

Any doubts I had were most effectively dispelled when officials of the Ministry of Agriculture showed me figures on the tonnage of eggs exported during the years 1939, 1943, and 1947. In 1939, the peak pre-war year, egg exports amounted to 103,000 tons; in 1943, at the height of the war, the export total had plummeted to 2,000 tons. Ministry officials were confident that by 1952 Danish egg export totals will approximate those of 1939.

I am certain that the chief element in Denmark's keeping her export statistics on an upward curve will be the continuation of the conscientiousness and meticulousness which the Danish people devote to quality production. The Danes virtually care for their eggs as products which are rare and costly; and in many sections of the ultimate export destinations of those eggs—England, Belgium, Palestine, an egg is indeed a rare and costly luxury.

As long as the Danish people, from the housewife on the farm to the stevedore at the shipping port, retain their feeling for quality and individual responsibility, the export production totals should continue to increase, and of course, the reputation of the high grade of Danish eggs will be maintained.

Virgil White, a 4-H Club winner of one of the National Poultry awards, recently completed a tour of Scandinavia under the auspices of the Lederle Laboratories Division, American Cyanamid Company. This trip was sponsored in the belief that American youth should come to know better our European farm cousins and their methods. Mr. White was accompanied on this trip by Karl E. Jensen, a Lederle executive, who is well-known in Scandinavia because of his connection for several years during the war with the American Embassy in Sweden. Mr. Jensen assisted in the preparation of this article which was written at our request—Editor. American Poultry Journal.

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